UNITED STATES DEPARTMENT OF AGRICULTURE

DIRECTORY
of
Bureaus and Offices and Their Principal Divisions
in Washington, D. C.

SECRETARY, THE OFFICE OF----------First floor, Main Building, 13th St. and the Mall.

ANIMAL INDUSTRY, BUREAU OF

Administrative Offices----------Room 205, East Wing, 13th and B Sts. S. W.

Animal Husbandry Division-------- " 66, 710 E St., N. W.

Biochemic Division---------- " 350, East Wing

Dairy Division---------- " 24, " " (Basement)

Editorial Office----------1350 B. St. (Second floor) S. W.

Experiment Station (Veterinary) Bethesda, Md., 1 mile northwest of District on electric car line to Rockville.

Experimental Farm----------Near Beltsville, Md., about 7 miles northwest of District.

Field Inspection Division--------Room 31, 710 E St., N. W.

Hog-Cholera Control Division----- " 229, East Wing.

Meat Inspection Division-------- " 58, 710 E St., N. W.

Miscellaneous Division----------1350 B St., S. W., (First floor).

Pathological Division----------Room 302, East Wing.

Quarantine Division----------1350 B St., S. W., (Second floor)

Tick Eradication Division--------Room 21, 710 E St., N. W.

Tuberculosis Eradication Division----------1350 B St., S. W., (Third floor).

Zoological Division----------Room 233, East Wing

BIOLOGICAL SURVEY, BUREAU OF

Main Offices (including most of the Washington Staff)---------Second floor, 1358 B St., S. W.

Branch Office----------New National Museum, the Mall.

CHEMISTRY, BUREAU OF

Offices

Chief of Bureau----------Fourth floor, 216--13th St., S. W.

Dehydration Investigations---------Second floor, Building C, 6th and B Sts., N. W.

Drug Administration----------Fifth floor, 216 13th St. S. W.

Imports----------Fourth floor, " " " "

Library----------Second floor, " " " "

Net Weight Investigations----------Fifth floor, " " " "

Cooperation---------- " " " " " "

Laboratories

Analytical Reagents Investigation Third floor, 216 13th St. S. W.

Animal Physiological----------Second floor, " " " "

Carbohydrate----------Third floor, " " " "

Color Certification----------Fifth floor, " " " "

Color Investigations---------- " " " " " "

Drug Investigations----------First floor, " " " "

Food Control----------Third floor, " " " "

Food Investigations---------- " " " " " "

Fruit and Vegetable Utilization----Second floor, " " " "

Grain Dust Explosions----------First floor, " " " "

Leather and Paper---------- " " " " " "

Microbiological----------Sixth floor, " " " "

Microchemical----------Fifth floor, " " " "

Miscellaneous Division----------Olive Building, 220 13th St. S. W.

Cattle Food----------Second floor, 216 13th St. S. W.

Insecticide----------Third floor, " " " "

Nitrogen----------Sixth floor, " " " "

Oil, Fat, and Wax----------Third floor, " " " "

Pharmacognosy----------Sixth floor, " " " "

Pharmacological---------- " " " " " "

Phytochemical---------- " " " " " "

Plant Chemistry----------Third floor, " " " "

Protein----------First floor, " " " "

Water----------Second floor, " " " "

CROP ESTIMATES, BUREAU OF

All Offices----------Second and third floors, Main Building, 13th St. and the Mall.

ENTOMOLOGY, BUREAU OF

Administrative Offices----------Entomology Building, the Mall.

Bee Culture Office and Laboratory-----423 Dorsett Ave., Somerset, Md.

Stored-Products Insects Branch--------Council National Defense Building, 18th and D Sts. N. W.

Staff of Workers and Insect Collection----------Top floor, New National Museum, the Mall.

FARM MANAGEMENT, OFFICE OF

Chief----------Room 305, 200 14th St. S. W.

Agricultural History and Geography---- " 201, " " " "

Crop Economics---------- " 401, " " " "

Farm Business Analysis Surveys-------- " 502, " " " "

Farm Finance---------- " 310, " " " "

Farm Machinery---------- " 407, " " " "

Farm Organization and Cost of Production---------- " 402, " " " "

Land Economics---------- " 403, " " " "

Live-Stock Economics---------- " 307, " " " "

Rural Life Studies---------- " 101, " " " "

FEDERAL HORTICULTURAL BOARD

Chairman----------Room 11, Entomology Building, the Mall.

Administrative Office----------Room 13, Entomology Building.

Domestic Plant Quarantines---------- " 13, " "

Foreign Plant Quarantines and Issuance of Permits---------- " 20, " "

Inspection Work----------Inspection House, 12th and B Sts. N. W.

Pathological Inspector----------Room 912, Council of National Defense Building, 18th and D Sts. N. W.

FOREST SERVICE

Forester----------Room 706, 930 F St. N. W.

District 7 (Office)---------- " 304, " " " "

Engineering---------- " 408, " " " "

Forest Management---------- " 604, " " " "

Grazing---------- " 608, " " " "

Lands---------- " 709, " " " "

Operation---------- " 704, " " " "

Public Relations---------- " 711, " " " "

Research---------- " 716, " " " "

INSECTICIDE AND FUNGICIDE BOARD

Administrative offices and chairman----------220 13th St. S. W.

Chemical and bacteriological examination of insecticides and fungicides for use on horses, cattle, sheep, swine, and goats----------East Wing, 13th and B Sts. S. W.

Insecticide Laboratory (Chemical, microscopical and bacteriological examination of insecticides and fungicides)----------220 13th St. S. W.

Pathologist in charge of testing of fungicides----------West Wing, 14th and B Sts. S. W.

Testing station for insecticides-----Vienna, Va., 12 miles from Washington.

MARKETS, BUREAU OF

Chief----------Room 700, Bieber Building, B St. near 14th S. W.

Compilation of Market Information----------Room 712, Bieber Building, B St. near 14th S. W.

Dissemination of Market Information----------Room 609, Bieber Building, B St. near 14th S. W.

Costs of Marketing Farm Products----------Room 610, Bieber Building, B St. near 14th S. W.

Cooperative Relations----------Room 508, Bieber Building, B St. near 14th S. W.

BUREAU OF MARKETS (Cont'd)

Cooperative Marketing of Farm Products	Room 1415 Council of Nat'l Defense Bldg.
Division of Cotton Marketing	Room 813 Bieber Bldg. (B St. near 14th S. W.)
Division of Live Stock, Meats & Wool	Room 721 Bieber Bldg.
Division of Dairy and Poultry Products	Room 1221 Council of Nat'l Defense Bldg.
Division of Fruits and Vegetables	Room 522 Bieber Bldg.
Division of Grain Marketing	Room 401 " "
Division of Hay, Feed and Seed	Room 416 " "
Foreign Marketing of Farm Products	Room 709 " "
Office Management and Accounts	Room 607 Council of Nat'l Defense Bldg.
Preservation of Perishable Farm Products	Room 603 Council of Nat'l Defense Bldg.
Transportation of Farm Products	Room 623 Bieber Bldg.
Warehousing	Room 720 " "
Wool Work of War Industries Board, Completion of	Room 522 " "

PLANT INDUSTRY, BUREAU OF

Administrative offices	Room 206, West Wing, 14th and B Sts., S.W.
Acclimatization and Adaptation of Crop Plants	Room 131, West Wing.
Agricultural Technology	Room 448 " "
Alkali and Drought Resistant Plant Investigations	Room 113 " "
Arlington Experiment Farm	Rosslyn, Va.
Biophysical Investigations	Room 40, West Wing.
Blister-Rust Control	Council of Nat'l Defense Building.
Cereal Investigations	1306 B St., S. W.
Congressional Seed Distribution	Council of Nat'l Defense Building.
Cotton, Truck and Forage-Crop Disease Investigations	Room 234, West Wing.
Crop Physiology and Breeding Investigations	Room 115, " "
Demonstrations on Reclamation Projects	Room 149, " "
Drug and Poisonous Plant Investigations	Room 348, " "
Dry-Land Agriculture	Room 144, " "
Economic and Systematic Botany	Room 102 " "
Experimental Gardens and Grounds	14th and B Sts., N. W.

PLANT INDUSTRY, BUREAU OF (Cont.)

Fiber Investigations	Council of National Defense Bldg., 18th & D Sts., N.W.
Forage Crop Investigations	Council of National Defense Bldg., 18th & D Sts., N.W.
Foreign Seed & Plant Introduction	Homer Bldg., 13th & F Sts., N.W.
Forest Pathology	221 Linworth Place, S.W.
Fruit Disease Investigations	Room 339, West Wing
Horticultural & Pomological Investigations	220 14th Street, S.W.
Pathological Collections	Room 331, West Wing
Physiological & Fermentation Investigations	" 348, " "
Plant Disease Survey	Council of National Defense Bldg., 18th & D Sts., N.W.
Plant Pathological Laboratory	Room 301, West Wing
Seed Testing Laboratory	Bieber Bldg., 1358 B Street, S.W.
Soil Fertility Investigations	Room 126, East Wing
Sugar Plant Investigations	" 308, West "
Tobacco Investigations	" 426, " "
Western Irrigation Agriculture	" 149, " "

PUBLIC ROADS, BUREAU OF

Chief	Room 507, 515 14th St., N.W.
Drainage & Irrigation Division	Second Floor, 422 Penna. Ave., N.W.
Engineering Division	Room 607, 515 14th St., N.W.
Rural Engineering Division	Third Floor, 515 14th St., N.W.
Tests, Division of	Eighth " " " " "

PUBLICATIONS, DIVISION OF

Chief of Division	First Floor, Main Building, 15th Street and the Mall
Division of Publications	215 13th Street, S.W.
Motion Picture Activities	310 Bieber Bldg., B Street near 14th, S.W.
Motion Picture Laboratory	Basement, Bieber Bldg.
Office of Exhibits	Council of National Defense Bldg., Room 73, 1730 D St., N.W.
Office of Information	One-story white building Near south side of Main Building

STATES RELATIONS SERVICE

Director----------Room 505, 220 14th St. S. W.

Agricultural Instruction in Schools---------- " 613, " " " "

Farmers' Institutes---------- " 601, " " " "

Editorial Division---------- " 518-A " " " "

Office of Experiment Stations------- " 512 " " " "

Office of Extension Work, South----- " 322, " " " "
Boys' Agricultural Club Work----- " 219, " " " "
Canning and Drying---------- " 220, " " " "
County Agent Work---------- " 317, " " " "
Home Demonstration and Girls' Club Work---------- " 220, " " " "

Office of Extension Work, North and West---------- " 109, " " " "
Boys' and Girls' Club Work------- " 201, " " " "
Cooperative Relationships and Subject Matter Specialists---- " 104, " " " "
County Agent Work---------- " 102, " " " "
Extension Work with Women-------- " 208, " " " "
Farm Management Demonstration Work---------- " 309, " " " "

Office of Home Economics---------- " 49, East Wing, Kitchen, 1312 B St. S. W.

SOILS, BUREAU OF

Chief of Bureau----------Room 118, East Wing, 13th & B St. S. W.

Chemical Investigations---------- " 139, " " " " " " "

Editorial Section---------- " 125, " " " " " " "

Fertilizer Resources---------- " 248, " " " " " " "

Laboratory----------Arlington Experimental Farm.

Nitrate Resources (Cooperative work with War Department)------- American University, Washington, D. C.

Physical Investigations---------- Room 250, East Wing, 13th & B St. S. W.

Soil Survey---------- Fourth Floor, Busch Building, 710 E Street, N. W.

WEATHER BUREAU

All Divisions and Sections--------- 24th and M Streets, N. W. (Front entrance, M Street side; automobile entrance 24th Street side.)

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UNITED STATES DEPARTMENT OF AGRICULTURE

June, 1920.

BUREAU OF ANIMAL INDUSTRY

John R. Mohler, Chief

Activities of the Bureau of Animal Industry are particularly those dealing with live stock and dairy production, disease control, inspection of animals and their products, research and similar lines of effort. The bureau has about 4,400 employees of whom more than 3,700 are assigned to duties in various parts of the United States, outside of Washington. The bureau is principally a field organization.

There are 14 main divisions in the bureau as follows:

Animal Husbandry Division--Conducts investigations and experiments in feeding, breeding, and management of live stock and poultry.

Biochemic Division--Biochemical and bacteriological research concerning animal diseases, meat production, and disinfectants. Prepares tuberculin and mallein for distribution to authorized officials. Conducts analyses of dips and disinfectants.

Dairy Division--Conducts research and field investigations of dairy farming and dairy products, performs certain inspection duties, studies production and manufacturing problems, and assists local agencies for dairy development.

Experiment Station--A veterinary experiment station is maintained at Bethesda, Md., for conducting investigations of animal diseases. Its facilities are used by the various divisions.

Field Inspection Division--Has charge of eradication of sheep scabies, cattle scabies, horse scabies, dourine, anthrax, influenza, etc. Supervises interstate transportation of live stock.

Division of Hog-Cholera Control--Carries on the field work against hog cholera. Directs field forces in various States, engaged in the investigation, suppression, and control of outbreaks of hog cholera and other infectious diseases of swine.

Meat Inspection Division--Conducts Federal meat inspection at slaughtering and processing establishments engaged in interstate and foreign commerce.

Supervises transportation of meats. Inspects imported meats.

Miscellaneous Division--Keeps records of bureau personnel; supervises veterinary colleges under the department's regulations, and performs other duties of varied character.

Pathological Division--Conducts work relating to animal diseases, their control and suppression, including bacteriological and pathological investigations into causes and nature of disease. Produces and distributes blackleg vaccine.

Quarantine Division--Supervises work relating to importation and exportation of live stock, and importation of hides, skins, wool, hair, and similar products especially with regard to danger of transmitting infection through these commodities.

Tick Eradication Division--In cooperation with authorities of various Southern States, conducts work of eradicating the cattle ticks.

Tuberculosis Eradication Division--Supervises eradication of tuberculosis from cattle and swine in cooperation with State authorities and individual owners.

Office of Virus-Serum Control--Has charge of regulatory work in the enforcement of the virus-serum-toxin law aimed to insure a high quality of commercial viruses, serums, toxins, and similar products for combating animal diseases.

Zoological Division--Conducts laboratory and field investigations of animal parasites.

Farms of the Bureau of Animal Industry.

In addition to the experiment station at Bethesda, Md., where investigations are largely of a veterinary character, the bureau maintains experimental and breeding farms at Beltsville, Md., Middlebury, Vt., and Dubois, Idaho. Besides these principal farms it conducts a great quantity of experiments on farms where the work is handled cooperatively with other bureaus, as at Huntley, Mont., and New Iberia, La., or with various States. The Dairy Division of the bureau supervises the work of the Grove City, Pa., Creamery, where dairy research results are tested under commercial conditions.

Important Work Already Completed.

Work which the Bureau of Animal Industry has carried to actual completion includes:

Discovery of the nature of Texas or tick fever and perfection of a method for eradicating the ticks which carry this fever. Thus far more than half a million square miles of formerly tick-infested territory have been freed from ticks and released from quarantine.

Practical eradication of tuberculosis from live stock in the District of Columbia, and in addition from 2,200 herds now on the accredited list.

Discovery of anti hog-cholera serum and methods for protecting swine from hog cholera.

Improved methods of making tuberculin for the diagnosis of tuberculosis in cattle and swine.

Complete eradication of pleuropneumonia from the United States, suppression of foot-and-mouth disease on six occasions, and the gradual eradication of other serious live-stock diseases.

Exclusion from the United States of about 10 serious animal scourges present in other countries. (Details of the disease situation are given in the Department's 1919 Yearbook, just published.)

Improvement through inspection and supervision of methods of handling export live stock.

Important Work Now in Progress.

Among the specific activities of practical and popular interest now being conducted are the following:

Development of an American utility breed of horse.

A 20-year experiment to determine how the milking qualities of beef cattle are transmitted.

Detailed experiment on inbreeding of dairy cattle.

Development of a breed of sheep about equally valuable for wool and meat.

Exhaustive experiments in animal genetics to obtain more definite information of the operation of heredity.

Methods of making Swiss, Roquefort, Camembert, and similar foreign cheeses so that American dairymen and factory operators may compete with the foreign trade in these products. This work is well advanced.

Requirements for milk production on farms in six typical sections of the United States. This work, partly completed, consists of observations reduced

to definite factors and relating especially to costs of production in terms of feed, labor, and other items.

Physiology of milk secretion with particular reference to the importance of mineral salts in the feed of high-producing dairy cattle.

Meat-inspection investigations of a varied character. For instance, the bureau has experimented with the effect of X-ray on trichinae in pork.

Continuous work is being done on stock-poisoning plants. This problem is especially important on western ranges.

Studies of internal and external parasites of live stock, particularly parasites which interfere with proper growth and development.

Eradication of cattle ticks, tuberculosis, and many other diseases.

Results Now in Process of Publication.

Many of the experiments have progressed far enough and have given sufficiently complete information to justify the publication of results. Among the more important bulletins containing these results, which are in process of publication, are the following:

Diseases of Sheep.
Parasites of Sheep.
A Primer of Animal Breeding.
Milk-Plant Construction and Equipment.
Principles of Live Stock Feeding.
Hog Lice and Hog Mange.
Feeding Garbage to Hogs.
Cost Factors in Producing Milk in Northwestern Indiana. (For the Chicago district.)

Besides those mentioned are a considerable number of technical or semi-technical publications. It is expected that all of the bulletins listed will be received from the printer within the next three months.

Relation Between Research, Experimental Work, and Extension Activities.

The most successful and direct method of making results of experiments available to a large number of farmers is briefly this: When research on any problem gives encouraging results the method of applying the principles discovered are tried in an experimental way under conditions as near like those of the average farm as possible. Following experience gained through the experiment, the method for accomplishing the desired result is repeated at other stations and farms of the bureau. Then when the method is considered well developed and suitable for general application, it is made the basis for extension work.

This same principle has been used with success in hog-cholera control, in improvement of cheese making, poultry culling, and the castration and docking of lambs. This order of procedure, namely: first, research; second, exhaustive experiments; and third, extension, is used with success by many large business houses, and it appears to be a logical method of giving new facts to the public. The extension work of the bureau is supplemented by literature, posters, lantern slides, motion pictures, and other mediums of publicity.

Important Policies of the Bureau.

Following are a few policies which indicate the bureau's attitude toward practical live-stock problems:

In disease control, both sanitation and a high standard of intelligence by live-stock owners need to be encouraged in every possible manner.

Farmers may wisely be encouraged to spend more time, labor, and money for clean-up and disinfection work, in proportion to the amount they now spend for drugs and remedies of various kinds.

Although live-stock owners may successfully treat some of the minor ailments of stock, it is best for a farmer's own interest, and especially for a community, to consult a competent veterinarian immediately when an infectious, or apparently infectious, disease breaks out.

The double or simultaneous treatment for hog cholera is preferred to the serum-alone treatment, when the operator is skilled.

The best policy of eradicating possible outbreaks of foot-and-mouth disease is that of quarantine and slaughter, together with compensation in the form of indemnity.

In tuberculin-testing work the demand for testing cattle under the accredited-herd plan shows the need for a greatly augmented force of inspectors. Since the number required probably will exceed the number which the bureau can furnish, arrangements for having the work done to some extent by private veterinarians seen practically essential.

When a person writes to the department for information relating to the Animal Industry, his letter is answered within three days in most cases. When the best qualified person to answer it is temporarily in the field, or the letter requires special investigation for the reply, it is acknowledged

and the writer is informed when he may expect a complete reply.

The bureau is endeavoring to raise the standard of the veterinary service in the United States by the supervision and accrediting of veterinary colleges. Since the Bureau of Animal Industry employs approximately 2,000 veterinarians, it is able to exert influence in that field.

The general tendency of bureau work in recent years has been to develop activities relating to the breeding, feeding, and general care of live stock in addition to conducting the disease-control work for which the bureau was primarily intended and for which it was originally organized. This tendency is regarded as constructive and beneficial and is being encouraged.

It is the policy of the bureau to have persons working on the larger and more practical agricultural problems spend a considerable portion of their time in the field.

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UNITED STATES DEPARTMENT OF AGRICULTURE

June, 1920.

BUREAU OF BIOLOGICAL SURVEY

E. W. Nelson, Chief

The Bureau of Biological Survey is charged with that part of the work of the Department of Agriculture which has to do with the wild birds and mammals of North America, including both the species considered as game as well as those which do not fall under that category. The activities in this work have very close connection with the agricultural production. The wild bird and mammal life of the United States has very intimate relations with agriculture and stock raising. Certain species, such as the game birds and animals, are valuable for the food they supply and the recreation afforded in their pursuit, while myriads of birds protect the farmers' crops from insect pests; yet other species are distinctly noxious in their habits, as in the case of predatory animals, which are destructive of live stock; rodents, which destroy crops and serve as carriers of diseases; and birds, which in certain instances become serious pests.

The object of the Bureau is to study the habits and distribution of the different species of birds and animals for the purpose of disseminating the knowledge concerning them in order that the useful ones may be properly protected, while the injurious ones may be destroyed. In addition, the Bureau administers Federal laws for the conservation of wild life.

The Biological Survey is the outgrowth of the Division of Ornithology and Mammalogy created by Congress in 1885, and now has 779 persons in its service; of these 90 with headquarters in Washington and 117 in the field are on the permanent roll, while 572 are seasonal employees in the field. The activities of the Bureau extend to every State in the Union, but owing to the needs of efforts for the protection of agriculture against animal pests the organization is strongest in the States west of the Mississippi River. The The organization of the Bureau and the appropriations for carrying on its work are as follows:

	1920	(1921)
Administration and statutory salaries	$ 66,730	($ 79,610)
Biological Investigations	24,400	(24,400)
Economic Investigations	464,440	(456,040)
Maintenance of Reservations	39,600	(44,735)
Enforcement of Migratory-Bird Treaty and Lacey Acts	147,000	(142,500)
Reindeer and Land Fur-Bearing Animals in Alaska	- -	(40,000)
Total for work of Bureau	$742,170	($787,285)

The amount estimated as needed for the fiscal year 1921 was $978,005.

The operations and chief accomplishments of the Bureau are as follows:

Biological Investigations.

This Division has for its object the collection and publication of definite information concerning the distribution and habits of birds and mammals in the United States and for migratory birds the determination of their breeding grounds, wintering places, and routes of travel. These investigations form the basis of the scientific, economic, and regulatory work of the Bureau. The results are utilized in field work for the destruction of predatory animals and injurious rodents, for preparing maps showing the extent of the natural life zones of the country, for State publications on mammals and birds, and for answering a multitude of inquiries regarding the range, abundance, and identity of native species.

Among the outstanding accomplishments are the mapping of the life zones of North America; the discovery, by improved collecting methods, of many small and hitherto unknown species of mammals and birds; the building up of museum collections of birds and mammals, the latter being unequaled elsewhere in the world; and the assembling of the greatest mass of information concerning these forms of wild life ever gathered for a continental area, an index of more than 1,500,000 cards.

Plans for future work by this section involve studies of the relations of rodents to agriculture and to vegetation in general, since it has recently developed that small rodents through their destruction of seeds and in newly sprouting vegetation have in many places a determining effect on the vegetation that can succeed in maintaining itself. This in many places becomes a vital factor in forest reproduction as well as in the growth of desirable forage plants on the cattle ranges of the West.

In addition, studies will be continued of the food plants of game animals, such as deer, elk, and others, with a view to determining the relationship between the grazing habits of game animals and those of live stock. It is believed that an abundant supply of certain large game animals may be maintained on the great stock ranges of the national forests and adjacent areas without serious detriment to the interests of the stock industry. This last investigation will be conducted in cooperation with the field work of the following section of "Economic Investigations."

Economic Investigations

This Division is charged with studying the relation of native birds and mammals to agriculture; determining their food habits; devising methods of controlling injurious species; ascertaining which are beneficial and recommending methods for promoting their increase; and collecting information regarding fur-bearing animals and recommending species suitable for domestication and the best methods of handling them.

The results have established the fact that birds are of inestimable value to agriculture, and the published reports have played a part in effecting the finest system of laws in existence for the protection of birds. Vastly improved methods have been developed for destroying animals injurious to crops, the range, and to live stock, and cooperative campaigns with State and private associations have been organized for lessening the losses to agriculture and stock raising from these sources. Assistance was given in campaigns for the control of bubonic plague near San Francisco and of rabies in predatory animals in Western States, by destroying ground squirrels, responsible for the former, and coyotes, for the latter; and for checking the Nevada mouse plague of 1907-8. Through educational campaigns and publications the work has increased the appreciation of the value of useful birds and mammals and of the possibility of protection against losses from injurious species.

The following summary gives an idea of the work accomplished under the activities of this division:

Losses of live stock from predatory animals, such as wolves, coyotes, and others, in the western range States have been estimated at from twenty to thirty millions annually, while injurious rodents, such as prairie dogs, ground squirrels, and others, occupying more than 200,000,000 acres of public and private lands, have been estimated to destroy crops valued at $150,000,000 and forage amounting to another $150,000,000. The organized force of hunters of the Biological Survey in the Western States has taken the skins of practically 100,000 predatory animals, 2,335 of which have been large gray wolves. In addition, approximately an equal number have been destroyed by extensive poisoning campaigns.

The methods of destroying both predatory animals and injurious rodents developed by the Bureau have been so successful that great interest has been awakened throughout the West and cooperation is constantly growing on a large scale. Many of the States are directly appropriating money for cooperation with the Bureau and more than 100,000 farmers and thousands of stock growers are personally taking part in the campaign. More than 33,000,000 acres of land have been partly or nearly cleared of rodent pests. Information obtain from the farmers and stock growers benefited indicated that a gross saving of between twenty and thirty millions has resulted. This saving is being perpetuated since by the destruction of the animal pests and the campaign which prevents their reinfestating the areas once cleaned the gain is duplicated in the crops for each succeeding year. The work done has demonstrated that it is wholly practicable within a limited number of years to reduce the serious losses from these animal pests to a nominal figure.

The great difficulty the Bureau is now experiencing is its lack of funds to meet the insistent demands of the States for fuller cooperation than is now possible. The Western States during the present year are expending about $1,000,000, much more than double the amount available to the Bureau, although the vast areas of Government lands in these States are the main resorts and breeding places for the pests which cause such a heavy drain on the live stock and crop production.

The house rat is estimated to destroy about $200,000,000 annually in food products and other property in the United States. The Bureau is conducting an educational campaign to bring about community actions for the rat-proofing of granaries and other buildings and the destructions of these noxious pests, which not only destroy property but are carriers of bubonic plague and other serious diseases of mankind.

Another activity in this section of the Bureau is the educational work being done to promote the breeding of domestic rabbits as a cheap source of meat supply and for the production of a cheaper grade of furs for wearing apparel and for supplying material for felt hats. In Europe the value of the food and the other products and the business resulting from the output of domestic rabbits amounts to hundreds of millions of dollars each year. Already in the United States a very large number of people, probably more than 100,000, are growing rabbits and the interest in the production of these animals is increasing with great rapidity. The meat from rabbits is fully equal to that from the domestic fowls and there is every indication that the production of food from this source will within a few years amount to a very large total.

Mammal and Bird Reservations

> The Division organized for the maintenance of these national reservations administers 69 bird reservations and 5 big-game preserves, established from time to time at suitable places for perpetuating these forms of wild life for the benefit of the public.

These reservations are distributed in twenty States and in Alaska, Hawaii, and Porto Rico. On the big game preserves are maintained herds of buffalo, elk, and antelope, all of which are increasing in numbers. On the Winter Elk Refuge in Jackson Hole, Wyoming, many thousands of elk, which come down in winter from Yellowstone National Park and from the national forests in Wyoming, are fed during severe weather, on hay raised or purchased for this purpose; without this aid great numbers of the elk would perish. The system of bird and mammal reservations established is probably the most extensive ever projected by any country.

Migratory-Bird Treaty and Lacey Acts.

Consolidated in one Division are matters relating to the enforcement of an act for the protection of birds migrating between the United States and Canada, passed to put into force a treaty with Great Britain; and to the enforcement of the Lacey Act, relating to illegal interstate commerce in game and importations of foreign wild birds and mammals.

From this Division are issued annually more than a hundred thousand copies of summaries of laws regarding game and fur-bearing animals, a comparatively small number for the five or six million hunters in the field each year. The problem of disseminating information concerning Federal and State laws regarding hunting is one of considerable magnitude and one of great importance in connection with law enforcement. Enforcement of the migratory-bird treaty act involves investigations of violations and securing evidence for submission to the Department of Justice through the Solicitor of this Department for prosecution. Since the passage of the act 434 convictions have been secured. The results of enforcement, in eliminating sale, prohibiting spring-shooting, restricting slaughter during the open season, and affording protection to birds on their breeding grounds, are already evident; a highly gratifying increase is reported of certain birds, particularly waterfowl, and the breeding in some localities of birds which heretofore went north to nest. Enforcement of the Lacey Act involves similar procedure leading up to prosecutions by the Department of Justice, and is conducted in cooperation with State game officials, transportation companies, and individuals interested in wild-life conservation. In the importation work, conducted in cooperation with the Customs Service, experienced men inspect shipments, identify species, and determine whether any are prohibited from entry under the act of Congress. A more comprehensive system of supervision of imports is maintained at our ports than by any foreign country, and since the law has been in effect, so far as known, no injurious species of mammals has obtained a foothold in the United States.

Alaskan Reindeer and Fur Animals.

Beginning July 1, 1920, under the provisions of the appropriation act for that fiscal year, the Bureau will take over certain work heretofore cared for by the Department of Commerce, relating to the reindeer industry in Alaska and to land fur-bearing animals in that Territory.

This work will be in cooperation with the Bureau of Education, Department of the Interior, which Bureau, in 1892, introduced the first reindeer into Alaska, 143 in number. These, and subsequent small introductions, have increased the herds to about 160,000, in addition to about 100,000 killed for food and skins. During the coming year the reindeer work will be organized and investigations begun to introduce new blood into the herds, to study the diseases to which reindeer are subject, and in every possible way to foster and build up this industry which not only is so vital to Alaskans, but offers a new source of meat supply for other parts of the United States. The fur-animals of Alaska promise, under wise management and domestication, to furnish an inexhaustible supply upon which the fur trade may draw perpetually, and from which the best quality of furs will continue to be produced.

Problems and Plans.

Among the problems upon which the Biological Survey is either now working on or which it would like to see brought to a successful solution are the following:

(a) General investigations into the food habits and their relation to agriculture of wild vertebrates other than mammals and birds, including the reptiles, toads, etc.

(b) Investigations to develop more thoroughly effective methods of trapping and poisoning predatory animals and injurious rodents in the West; and to secure a better knowledge of mammals east of the Mississippi and their relations to man, including moles, mice, bats, etc.

(c) Domestication of fur-bearing animals in the United States, including Alaska, securing laws for their more effective conservation, and developing the reindeer industry in Alaska.

(d) Domestication and successful propagation of game birds, including both waterfowl and upland species.

(e) Development of a series of refuges for antelope and other big game animals, especially on the public domain, and for migratory game and insectivorous birds at suitable places where most needed; and on these reservations a study of the wild life as regards species, fluctuating numbers, migrations, etc. It is desired to develop a great series of wild-life refuges in the United States in cooperation with the States for the purpose of making reservoirs where wild game birds and animals may breed and by their overflow or surplus perpetuate game which may be hunted and thus prove a source of meat supply, as well as promoting a highly appreciated, healthful out-of-door recreation.

(f) Particular attention is given to advocating the conservation of water areas which are capable of more value in their natural condition than would be the land uncovered by their drainage. The handling of these water areas to secure their maximum production for the benefit of the public may be termed water farming, which includes an output of fish, furs, and wild fowl. In addition, in the North these water areas furnish a cheap source of ice supply and in summer offer facilities for boating and for other forms of out-of-door recreation which are of great value in adding to the attractions of the areas where they occur by assisting in maintaining the public health through promoting out-of-door life.

(g) The migration of North American birds, including investigations of conditions effecting their welfare in their wintering grounds in Mexico and South America in order that proper measures may be taken for the better conservation of our valuable game and nongame birds.

UNITED STATES DEPARTMENT OF AGRICULTURE

June, 1920.

BUREAU OF CHEMISTRY

C.L. Alsberg, Chief

The Bureau of Chemistry is charged with the enforcement of the Federal Food and Drugs Act, commonly called the pure food law, with technological investigations looking to the improvement of existing, and the development of, new processes for handling and utilizing farm products in order to prevent loss from spoilage and to find new uses for products which now for one reason or another are largely wasted. It also directs scientific research looking to the advancement of the sciences which are at the basis of agriculture and the manufacturing industries which use agricultural products. This bureau is concerned, therefore, primarily with the handling and the use of farm crops after they have been produced. The application of chemistry to soils, fertilizers, and growing plants, and most problems of farm production are handled through other bureaus of the Department.

The enforcement of the Food and Drugs Act is administered by the Chief and the Assistant Chief of the Bureau. Laboratories are organized in Washington under the direction of staff specialists who assist the Chief and the Assistant Chief in formulating policies, in arriving at proper definitions and standards for foods and drugs, and in solving problems of a technical nature that arise in the course of the work.

The following units which are engaged as staff advisers in the regulatory work also do other investigational work on the subjects on which they specialize: Cooperation, Drug Administration, Carbohydrates, Food Control, Food Investigation, Microbiology, Microchemical, Cattle Food, Pharmacognosy, and Water and Beverage.

The work of securing evidence of violations of the law and of carrying out the policies of the Bureau is done by Food and Drug inspection stations located in the leading ports of entry and trade centers of the United States. These stations are organized into an Eastern, a Central and a Western District with headquarters at New York, Chicago, and San

Francisco respectively. The Eastern District includes stations at New York, Boston, Baltimore, Buffalo, Savannah, Philadelphia, and Porto Rico. The Central District stations are located at Chicago, Minneapolis, St. Louis, Cincinnati, New Orleans and Kansas City. The Western District has stations at San Francisco, Seattle, Denver and Los Angeles.

The other technological and investigational work of the Bureau is carried on through the Food Research Laboratory at Indianapolis, the Citrus By-products Laboratory at Los Angeles, and the following laboratories in the Bureau at Washington: Animal Physiological, Analytical Reagents, Color Investigation, Drug Investigation, Fruit and Vegetable Utilization, Grain Dust Investigation, Leather and Paper, Miscellaneous, Oil, Fat and Wax, Pharmacology, Phytochemical, Plant Chemical, and Protein. The specialists in the research laboratories are called upon occasionally to assist in the solution of regulatory problems.

THE STAFF.

The normal staff of the Bureau of Chemistry is about 700 which includes 350 technical and scientific men, 130 clerks, 51 Food and Drug Inspectors, 45 State Collaborators, and 92 mechanics, laborers, messengers and the like.

At the present time, the Bureau is forced to operate with only about two-thirds the normal staff. Something less than one half of the staff are employed in Washington and the remainder at the stations and laboratories previously mentioned, and at other points in various parts of the United States. The average salary for the technical and scientific staff is about $2,000 and for the entire staff considerably lower. The rate of turnover in the staff has during the last two or three years been exceedingly large and the work of the Bureau is now being handicapped by the lack of a sufficient number of high grade men with the requisite training and experience.

APPROPRIATIONS

The total appropriation for the Bureau of Chemistry for the fiscal year beginning July 1, 1920, is $1,333,591. The appropriations for the Bureau are subdivided as follows: For salaries of other than the scientific staff, $426,190; for the application of chemistry to agriculture, $70,400; for collaboration with other Departments of the Government, $14,000; for investigating the handling, grading, packing, canning, freezing, storing and trsnsportation of poultry, eggs, fish, and oysters, $52,880; for color investigations, $68,260; for development of methods for the manufacture of table sirup, $15,000; for the enforcement of the Food and Drugs Act, $579,361; for tea inspection, $40,000; for investigating the grading, weighing, handling, transportation and uses of naval stores, $10,000; for improving methods for the manufacture of insecticides, $25,000; for development of a dehydrating industry, $23,500; for the utilization of wool scouring waste, $9,000.

To get the greatest possible returns from the money appropriated for this Bureau, a budget is made up at the beginning of the fiscal year, and each organization unit is allotted a definite sum to carry on the work under the direction of the man in charge. Each man in charge of an organization unit is required to submit a program of work for the year with a detailed estimate of the cost. The program and the estimates are revised by the Chief of the Bureau, and by means of a cost accounting system and reports of results accomplished each man is held responsible for securing adequate returns for the allotment made to him. This system fixes responsibility and provides an incentive for each man in charge to conduct his work with the greatest possible degree of economy and efficiency, since his advancement in the Bureau depends upon the results he secures from his allotment.

SOME LEADING ACTIVITIES.

The development of methods of analysis for foods, drugs, and many other agricultural products is one of the services the Bureau renders the chemists and bacteriologists who are engaged in agricultural and food control work. The methods developed by the scientists of the Bureau are used generally in all the state experiment stations, agricultural colleges, and other state and municipal laboratories throughout the country. This work is to the agricultural chemist about what the construction of good roads is to the farmer; it provides a more economical and efficient way for him to get where he needs to go. The Bureau is greatly aided in this work by the collaboration of the state agricultural chemists.

NUTRITION INVESTIGATIONS.

A chemical study of the composition of the proteins of various substances has yielded most interesting results that are of value in determining a feeding ration for stock and a more balanced diet for man, and will probably lead to the more extending utilization for feeding purposes of some more or less neglected by-products such as the press cake of the peanut and of copra.

It has been found that a loaf made from wheat flour with a small admixture of peanut flour and salts furnishes a diet that is biologically complete, is properly utilized by animals, and maintains a normal growth. Even smaller amounts of soy-bean meal will give similar results. The proteins of various grains and other substances are being studied. Copra press cake has been shown to be a most valuable addition to corn feed. Corn lacks certain essential elements and when supplanted with the substances containing them, its nutritive value is greatly increased.

UTILIZING CITRUS BY-PRODUCTS.

The by-product laboratory at Los Angeles, which has been studying the utilization of cull oranges and cull lemons, has developed methods for the manufacture of a number of products and has improved existing methods.

When these investigations were begun there were but one or two struggling by-product companies in California, which were making no appreciable inroad into the enormous supply of cull fruit available. After a few year's work and the expenditure of less than $100,000 this situation has materially changed. Four stable, going concerns, three of them privately owned, and one a cooperative growers' company, are now manufacturing lemon by-products. The total annual manufacturing capacity of these plants is over 1,500,000 pounds of citric acid, over 500,000 pounds of citrate of lime, and over 50,000 pounds of lemon oil. Some 20 concerns may be said to be producing orange by-products on a considerable scale. The products consist largely of marmalade, about 50 per cent of which is produced by one cooperative company. Marmalade stock, jellies, and candied peel are

also being made in smaller quantities. The total output of orange by-products for the present year will approximate 6,000,000 pounds. Proof of the advance which has been made since this project began is the increase in the price of cull fruit. Less than five years ago cull lemons could be had in large quantities at $5 a ton; to-day advertisements appear in several agricultural papers offering from $20 to $25 a ton for the same material, in face of the fact that a larger quantity is now available. The same situation exists in the matter of oranges. In former years $5 would buy a ton of sound cull oranges; the price at the present time for sound culls is from $20 to $30 a ton.

LONGER LASTING LEATHER.

Investigations on a small scale for the improvement of methods of tanning leather are under way. Tests have been devised for determining the relative wearing qualities of different leathers. It is believed that leathers better suited for specific purposes such as harness making, soles for shoes, book-binding and the like, can be made through improved tanning methods. It is desired to make a complete scientific study of tanning processes and tanning materials.

This work is of especial interest to agriculture since hides from which the leather is made is a farm product and the farmer is the largest single consumer of leather. A farmers' bulletin giving instructions as to best methods of skinning animals has been published. Another bulletin on ways of treating shoes and harness to make them last longer will soon be issued. A small amount of work will be carried on under a general appropriation.

DUST EXPLOSIONS.

As a result of work looking towards the prevention of explosions in threshers, the number of such explosions in the Pacific Northwest has been reduced from more than 300 with a property loss of $1,000,000, in 1914, to less than 60 with a property loss of $15,000, in 1919. Practically no explosions occurred in the threshers equipped with the safety devices recommended by the Department. The campaign to reduce explosions

in flour mills and grain elevators conducted during the war had to be suspended last year for lack of funds, but that part of the work relating to the stocks of grain held by the U. S. Grain Corporation was financed by that corporation as a means of insurance.

During the period of 20 months from October 1919, to May 1919, when the prevention campaign was active no explosions occurred in plants where the precautionary methods recommended by the Department had been adopted, while in twenty months previous at least five disastrous explosions occurred resulting in the loss of 36 lives, injuries to many others, and property loss in excess of $6,500,000. In the work for the U. S. Grain Corporation, grain stocks at all times averaging $100,000,000 in value were carried and at times as much as $500,000,000 stock was carried. The insurance on this stock would have cost $3,000,000. As a result of the protective work the Grain Corporation lost during the year but $25,000 from fire or explosion.

POULTRY, EGGS AND FISH.

Improved methods for packing, shipping, and storing poultry, eggs and fish are being developed as a result of the work of the Food Research Laboratory. Chilling rooms for small shippers, improved refrigerator cars, more efficient packing cases, and other devices for use in the poultry and fish industries are being rapidly adopted with the result that losses from spoilage and breakage are greatly reduced.

At one time the railroads claimed that they handled eggs at a loss because of the breakage for which they had to pay. Since the adoption of improved methods recommended by the Bureau, the claims for breakage have been greatly reduced. The railroad companies, as well as poultry and egg shippers, generally cooperate with the Department in developing and introducing ways to reduce the losses in handling these highly perishable products. Another result of this work has been the shipment to inland cities of fresh fish in prime condition. The fish resources of the Nation have been fully utilized because of the difficulty of shipping fresh fish for long distances to inland cities. Many of these difficulties are now being overcome.

ENFORCEMENT OF THE FOOD AND DRUGS ACT.

This work is of interest to farmers, both as consumers and as producers of human food and of stock feeds. As the result of this law there is today less adulteration and misbranding in foods than in any other class of merchandise. Both as an economic and as a public health measure, this law is of prime importance to the country.

The increased cost of all ingredients entering into the manufacture of foods and drugs has increased the temptation to unscrupulous manufacturers to adulterate and misrepresent their products. New forms of adulteration are appearing. Greater vigilance than ever is now required to keep the channels of interstate commerce free from adulterated and misbranded foods and drugs. A complete report of the results accomplished during the last fiscal year in the enforcement of the law will be found in the Report of the Chemist for 1919.

Chemistry plays a primary part in all industrial development, and the aid that it can render the basic industry of agriculture is limited only by the resources of men and money available.

UNITED STATES DEPARTMENT OF AGRICULTURE,

June, 1920.

BUREAU OF CROP ESTIMATES.

Leon M. Estabrook, Chief.

The Bureau of Crop Estimates serves as the statistical clearing-house of the U. S. Department of Agriculture and for agriculture as an industry. It was organized as a division of statistics in the Patent Office in 1840, was transferred to the newly organized Department of Agriculture in 1863 and became the nucleus of that Department; was re-organized as the Bureau of Statistics in 1903, and as the Bureau of Crop Estimates in 1914.

The Bureau of Crop Estimates prepares and issues the monthly Government crop reports, the Monthly Crop Reporter, the Statistical Appendix to the Yearbook of the Department of Agriculture, the Weekly Truck Crop News Service (discontinued in 1920), Weekly Crop Notes of Field Agents, and Semi-Monthly Foreign Crop Notes, and issues summaries of crop reports on crop reporting days to the associated press and telegraphs them to a field agent in each State who releases them to all State and local papers for immediate publication. The Bureau also transmits to the International Institute of Agriculture at Rome the crop estimates of the United States and receives from the Institute the crop estimates for all adhering countries of the world. The Bureau maintains the most complete collection of agricultural statistics in the world and answers the heavy and growing correspondence involving the statistics of every branch or phase of agriculture so far as available.

Organization of the Bureau.

In Washington: Administrative staff, statisticians, statistical clerks and computers, clerical and messenger force, about 110 employees; average salary about $1,200.

In the field:

42 State field agents, 1 in each of the larger States and 1 for each group of smaller States; average salary about $2,100; qualifications, 25 to 45 years of age, 5 years' practical experience in farming, equivalent to 4 years' course in agricultural college or 3 years' practical experience in responsible statistical work. Each field agent maintains permanent headquarters in each State, collects information by personal inspection of crops and interviews with best informed men in each county, and by monthly reports from 500 to 5,000 selected crop reporters. He reports weekly and monthly to the Washington office and handles correspondence with respect to crop and live stock statistics in his State.

39 field clerks in the office of the State field agents to assist in tabulation, correspondence and files; average salary about $900.

10 crop specialists, same qualifications as field agents, average salary about $2,200; each specializes on a particular crop, as cotton, tobacco, rice, fruit and truck crops; collects information by same methods as field agent, but disregards State lines.

3,000 county reporters, serving without compensation, each reporting for his county directly to the Washington office, basing reports on personal observation and reports of aids.

32,500 township reporters, serving without compensation, each reporting monthly for his own neighborhood direct to the Washington office, basing reports on personal observation and interviews with neighbors.

25,000 field aids, serving without compensation, each reporting monthly for his own neighborhood or county direct to the State field agent.

155,000 special reporters, serving without compensation, each reporting weekly, monthly, or periodically, either to the Washington office or to the State field agent, on the particular crop in which he is personally interested, as potatoes, apples, peanuts, beans, sugar crops, fruit and truck crops, live stock, etc.

Total number of crop reporters about 215,000.

What the Government Crop Reports are.

The Government crop reports are estimates of the acreages planted to different crops, growing condition of crops, forecasts of crop production, estimates of yields per acre at harvest, total production, and farm prices for about 60 different crops; estimates of the number of each class of live stock on farms in January, number of brood sows, live stock losses from various causes, and farm prices; wages of hired farm labor, hours of labor on farms, and prices farmers pay for machinery and supplies; special estimates of seed, labor, and fertilizer requirements on farms, acreage and production of principal varieties of some of the staple crops, and marketable surplus production of certain fruit and truck crops.

How Reports are Prepared and Issued.

Several million schedules are used annually by the Bureau. These are printed several months in advance and sent to the reporters in time to be filled out on the first day of each month and returned either to the Bureau or to the State field agent or the crop specialist. Each class of reports is tabulated and summarized separately and independently of all others, so that each source of information can be used as a check on all other sources. The results are summarized by a Crop Reporting Board at the Washington office composed of the Chief of Bureau and several of his most experienced assistants, together with one or more field agents called in each month.

This organization for collecting and summarizing information from every county and township regarding crop and live stock conditions operates monthly throughout the year. The results are summarized and released on dates fixed and announced in advance by the Secretary of Agriculture.

Accuracy of the Government Crop Reports.

The accuracy of the Government crop reports depends not only upon the trained judgment of experienced field agents and crop specialists but upon the stability and accuracy which comes from the use of information supplied by many thousands of individual farm observers. It is essentially a system of sampling.

Experience has shown that if a sufficient number of fair or representative samples be taken from different parts of carload the grade or quality can be determined just as accurately from the samples. So the theory is that what is true of the individual farms of crop reporters in each township or county throughout the United States will be true of all farms; also by the law of probability, if a sufficiently large number of individual reports can be obtained from representative farmers, the overestimates will tend to offset or counterbalance the underestimates. This principle has been demonstrated in actual practice thousands of times, and the results of averaging a large number of returns, any one of which may deviate more or less from the actual facts, is often quite startling.

For many crops there are no absolute checks on estimates of production, because of the absence of an annual census and because a large portion of the crops produced are consumed on farms where grown so that only the portions which are shipped out of the counties where grown can be checked against crop movement; receipts at market centers and exports.

However, for a few crops complete checks are available. Cotton is one of these. Every pound of cotton to be available for use must be ginned; that is, the seed must be separated from the lint in a ginning establishment. The Bureau of the Census, Department of Commerce, is required by law to ascertain and report the number of bales actually ginned, the final report each year being made about March 20 for the preceding season. For the last 19 years, the estimates of the Bureau of Crop Estimates made several months in advance of the final ginning reports, have checked out to within less than 1-1/2 per cent on the average, and this average deviation is an underestimate. For several recent years the estimates have checked out to within less than 1 per cent, and for two recent years within less than 1/2 of 1 per cent.

The Bureau's estimate of the 1915 rice crop was bitterly attacked by a rice growers' association as being 10 per cent too high and tending to reduce the price and cause the loss of millions of dollars to the producer. A canvass of all the rice mills in the South, in fact a complete census of them, showed that the quantity of rough rice received by mills, plus the quantity of rice used for seeding the following crop, was within less than

1/2 of one per cent of the quantity estimated by the Bureau, and that the Bureau's estimate was under instead of being 10 per cent too high, as charged.

Since the U. S. Grain Corporation has had charge of the purchase and distribution of the wheat crop of the United States a complete check on the estimated wheat production is available. At the close of the 1918 crop season it was alleged that the Bureau of Crop Estimates had overestimated the wheat crop. However, if to the total receipts of wheat reported by the Grain Corporation we add the quantity of wheat required for seeding the following crop, and also add the small fraction of the crop of inferior and damaged grain which is mostly fed to poultry and live stock, and if we make a fair allowance for the wheat ground in local country mills of small capacity which were not required to report to the Grain Corporation, we find that the Bureau underestimated the 1918 wheat crop by about 2 per cent. In all probability it will be found that the 1919 crop was estimated just as accurately as the 1918 crop.

This is a remarkable degree of accuracy, probably about as accurate as a census; certainly, no other organization in the world has ever attained the same degree of accuracy for so many different crops through a series of years.

Reports Carefully Guarded.

Many of the crop estimates are forecasts of production and future supply. Obviously, if such forecasts could be obtained in advance of their publication by any individual who knew how to use them for speculating purposes, the information would be extremely valuable. It is therefore necessary to surround the preparation of the crop reports with every possible safeguard to prevent advance information from being obtained or utilized by anyone.

Criminal statute prohibits any employee concerned in the preparation of the Government crop reports from speculating in any product of the soil, from knowingly compiling or issuing any false statistics, or from furnishing information directly or indirectly in advance of the dates specified by the Secretary of Agriculture for the publication of the reports, under penalty of a fine of not to exceed $10,000, or imprisonment for not to exceed 10 years, or both. The work in the Bureau itself is so systematized that no individual, neither the clerks who handle the returns nor the Secretary of Agriculture, has an opportunity of knowing what the United States totals or average for any crop will be until within a few minutes before the report is released.

The reports from the State field agents are separated from the regular mail in the city post office and delivered by special messenger directly to the Secretary of Agriculture or his Assistant, by whom they are placed unopened in a locked receptacle to which he alone has the key. Such reports do not come into the possession of the Bureau of Crop Estimates until the morning of crop reporting day. The reports from the voluntary reporters come direct to the Bureau and are separated by classes, by States and by districts within States. Each class is tabulated separately on large sheets which are cut up into sections and distributed among expert computers without any clue by which any sectional sheet can be identified with the particular State or crop, except a mere reference number to which only one man in the Bureau has the key.

On crop reporting days all telephones are disconnected, the entire Bureau is locked in with guards stationed at the outer doors, and the Crop Reporting Board is locked in an inner room, so that there can be no communication within or without the Bureau. Promptly at the hour and minute, set a year in advance by the Secretary, a summary of the report is released to representatives of the press associations by whom it is immediately flashed to all the metropolitan journals for publication the same or the following day. At the same time the summary is also telegraphed to each of the State field agents of the Bureau and a sufficient number of copies are run off by him to supply all the local papers in the State. Within a few hours the manuscript for the monthly crop report is sent to the public printer for printing.

Checking Speculation.

> Speculation thrives on the lack of public information, doubt and uncertainty. If all the essential facts were known to the public there would be very little room for speculation.

Crops are grown in the open and can not be hid. Speculators have their own sources of information; they obtain it through salesmen, through buyers, through country merchants and local bankers, through private crop reporting agencies, and through the employment of so-called crop experts. Nothing would please them so much as to have the Government crop reports suppressed, so that the public would be in doubt and the speculators would be free to issue

such information as would best serve their own selfish interests. The greatest protection which farmers and the consuming public can have against false and misleading reports and the operations of unscrupulous speculators is full, complete, dependable, disinterested and authoritative Government crop reports.

Belief of many farmers, amounting almost to a superstition, is that the Government crop reports have some mysterious connection with taxation. This belief is wholly without foundation in fact, because all individual reports are treated as strictly confidential and are not accessible to any tax assessor or other public official outside of the Bureau. Only totals and averages are published. It is said that this belief is constantly met with in practically every country in the world.

Reorganization of the Bureau.

> The Bureau of Crop Estimates was reorganized in 1914, the principal innovation being the employment of field agents, crop specialists, and field clerks - in other words, putting trained men into the field to personally inspect crops, to supplement and interpret the data furnished by voluntary crop reporters, and to accumulate in a State office all the statistical information regarding crop and live stock production in each State; the crop specialists to specialize on particular crops, supplementing the work of the field agents and voluntary reporters, keeping in touch with and securing the cooperation of organizations of growers of these crops, ascertaining the needs of the growers and supplying them with the kind of information most needed.

These field agent offices also handle an enormous volume of correspondence which comes to them direct or which is referred to them by State officials calling for statistical information for the State, thereby relieving the central office at Washington. The system of field agents and crop specialists has revolutionized the crop and live stock reporting service.

Progress Since Reorganization.
(1913 and 1920 compared)

(1) Appropriation increased from $240,892 to $371,102, total increase 54 per cent, annual increase about 8 per cent.

(2) Employees in Washington office increased from 100 to 110, total increase 10 per cent, annual increase about 1-1/2 per cent.

(3) Employees in field increased from 70 to 89, total increase 27 per cent, annual increase about 4 per cent.

(4) Total employees increased from 170 to 200, total increase 17.6 per cent, annual increase about 2-1/2 per cent.

(5) Voluntary crop reporters increased from 109,500 to 216,000, total increase 97.2, annual increase about 14 per cent.

(6) Schedules used annually increased from 1,422,000 to 6,000,000, total increase about 322 per cent, annual increase 46 per cent.

(7) Average of all salaries increased from $1,093 to $1,219, total increase about 11.5 per cent, annual increase about 1.6 per cent.

(8) Work per employee increased about 246 per cent, annual increase about 35 per cent.

(9) Cost per unit of work decreased by 63.5 per cent, annual decrease about 9 per cent.

(10) Increase in rate of work per employee about six times rate of increase in appropriation.

(11) Increase in rate of work about fifteen times rate of increase in number of employees.

(12) Bureau established a fruit crop reporting service, especially for apples, peaches and pears, in response to specific demands of commercial apple growers, who desired periodical estimates of production by varieties, production by districts of commercial importance, and marketable surplus production, i. e., portion of crop marketed from farms as distinguished from total production on farms, much of which is never marketed. This service has brought the Bureau much commendation, and has saved the growers large sums of money. The President of the Eastern Fruit Growers' Association states that this special service in 1919 was worth to the commercial apple growers alone not less than 1 million dollars, or nearly three times as much for this one crop as the entire cost of the Bureau for more than 60 crops and 6 classes of live stock.

(13) The Bureau established a truck crop reporting service corresponding with its special fruit crop reporting service and with equally satisfactory results to the growers.

(14) In 1919 the Bureau established a system of reporting on the commercial potato crop twice a month as the crop approaches maturity when growers are making selling contracts, which will save to the growers more than the entire amount involved in the Bureau's estimates of appropriation. The President of the cooperative potato growers' association in Clay County, Minnesota, telegraphed that the service had been worth to the potato growers in his county at least $100,000 in 1919.

(15) Since 1913 the Bureau has added to its regular estimates reports on grain sorghums, alfalfa, peanuts, beans, honey, cranberries, and a number of other special crops.

(16) For the past two years the Bureau has estimated, on a limited basis, monthly changes in numbers of live stock.

(17) In many States the Bureau field agents have made county estimates within the last two or three years.

(18) The Bureau has combined personnel and equipment under formal cooperative agreements with State Departments of Agriculture in 17 States, thereby economizing in funds, avoiding duplication of effort and unnecessary expense, and greatly improving the service.

(19) The Bureau has systematically sought and won the cooperation of State, local and private agencies in every State.

(20) The Bureau has largely overcome the widespread feeling of indifference, antagonism, which prevailed in the past, and now has the friendly cooperation of the best informed men, including State Departments of Agriculture, State Colleges of Agriculture and Experiment Stations, State Extension Services, county agents and Farm Bureaus.

VALUE OF GOVERNMENT CROP REPORTS.

The prices farmers receive in relation to their cost of production determines whether or not the business of farming is profitable. Prices farmers receive are determined by the law of supply and demand, i. e., relation of supply to demand. The demand for farm products is practically constant, tending to increase with growth of population. The supply is therefore the real price-determining factor. The Government crop reports containing dependable information with respect to the essential facts of production and supply, present and prospective, are necessary because --

(1) They are more complete, accurate and comprehensive than can be compiled by any private or State agency.

(2) They are disinterested and unbiased: All Government employees concerned in the preparation or issuance of the Government crop reports are prohibited by law from (a) speculating in any product of the soil, (b) from knowingly compiling or issuing any false statistics, and (c) from communicating directly or indirectly any information concerning a forthcoming report in advance of its release to the public, under penalty of a fine of not to exceed $10,000, or imprisonment for not to exceed 10 years, or both. The preparation and issuance of the crop reports is surrounded by every possible safeguard so that even the employees who prepare the final report are unable to know the results until within a few minutes of the time of their release, and up to the very minute of their release these employees are locked in, under guard and all telephones are disconnected.

(3) They are nation wide in their scope and all reports are on a uniform and comparable basis for all States.

(4) They are authoritative, having the sanction and prestige of the Federal Government.

(5) The Federal Government can obtain information from individuals, firms and corporations, and from other Federal and State institutions, which is not available to private individuals or agencies.

(6) They protect producers and consumers by tending to prevent the issuance of false and misleading reports by speculators.

(7) They tend to reduce or prevent speculation in farm products by making available to farmers and the public dependable information as fully and completely as can be obtained by speculators.

(8) They reduce the risk involved in buying and holding farm products because of increased certainty with respect to the supply, thereby enabling buyers to operate on smaller margins and pay higher prices to farmers.

(9) They enable boards of trade and exchanges which deal in farm products to make price adjustments more nearly in accordance with the facts of production, supply and demand and less in accordance with the interested maneuvers of speculators, thus tending to equalize and stabilize prices.

(10) They enable transportation companies to supply cars when and where needed, if cars are available.

(11) They enable banks to estimate the financial requirements of farmers and business men for financing crop production and crop movement, and provide the necessary funds.

People and Agencies Benefited.

Dependable information with respect to the essential facts of production and supply are of beneift to --

(1) Farmers, in deciding whether or not to increase or decrease production.

(2) Farmers, indeciding whether or not to sell at present prices or hold for probable higher prices later, i. e., to sell at top prices.

(3) Farmers' associations and organizations, in planning constructive programs of production and marketing.

(4) The Federal Department of Agriculture as a basis for constructive work and in formulating comprehensive and constructive programs of production and marketing.

(19) Consumers, in buying supplies and in estimating probable trend of future prices.

(20) Federal and State Government in time of peace to promote economic development, prosperity and welfare, and in time of war definite data are necessary for the national security and defense.

War Service of the Bureau of Crop Estimates.

Following the breaking out of the war in 1914 widespread interest developed in the food situation and the work of the Bureau more than doubled. Immediately after the United States entered the war, the Bureau was literally overwhelmed with requests for information concerning the present and the prospective food supply, not only for the United States but for practically every important country in the world. Many alarming rumors were circulated to the effect that food production would be inadequate for the needs of our military forces and civilian population.

From time to time the Secretary would call upon the Bureau to investigate and report upon these rumors. On such occasions the Bureau would telegraph or write its field agent in each State and within a few hours or days would have complete and dependable information from every State. In practically every case the rumor was found to be without any foundation. With its trained field agents and crop specialists and its 215,000 farmer crop reporters representing every township and county in the United States, the Bureau served not only as a statistical clearing-house, but also as a bureau of farm intelligence for the Government.

The improved service resulting from better organization and system gradually became known and appreciated and resulted in a steady increase in the demands upon the Bureau for special service. Because

farmers and business men are more and more coming to realize the fundamental importance and bearing of dependable data upon the business side of farming and marketing and distribution of farm products, the demand for such data may be expected to increase.

Preparation for the 1920 Census.

The past six years have been years of intensive preparation for the 1920 census and many improvements have not been effected for two reasons, chiefly:

First: Much of the work of crop and live stock estimating is based on census data, especially with respect to acreages, numbers of live stock, and county data. For instance, a complete enumeration of acreages and numbers of live stock by counties for all farms constitutes a census which is impracticable every year by reason of the enormous expense and time involved --- about 15 million dollars and 2 or more years in time. It is therefore necessary to estimate crop and live stock between census years on a percentage basis. Starting with census data the Bureau estimates each year the percentage of increase or decrease in acreage and numbers of live stock, so that the census is the real basis of the estimates. Unless these estimates are made annually beginning with the census year, and a year or more is allowed to elapse after the census is taken, it is exceedingly difficult if not impracticable to undertake to estimate any crop or class of live stock because of the changes that have taken place during the interval which it is impossible to check up accurately. This is one of the main reasons why the Bureau has postponed attempting to estimate, or to procure the necessary funds for estimating, a number of crops and live stock products, such as seed, and nursery crops, many fruit and nut crops, several field crops, vegetables oil crops, forest crops, dairy and poultry production, etc., which in the aggregate have an annual value of several billion dollars.

Second: In preparation for the 1920 census and the opportunity which comes once in 10 years for expanding the service to enable the Bureau to supply information specifically demanded by farmers and business men, the Bureau has perfected its organization and system to a high degree of efficiency, and has learned by actual trial and experience the limits of efficiency of the present force and system. It has tried

or seen tried every known method of crop and live stock estimating, in order that it might know exactly what methods are practicable, how many men will be needed and what it will cost to supply crop and livestock statistics for which there is an increasing demand.

Cooperation with States.

In nineteen out of the 48 States the Bureau has combined its facilities and resources with those of the State department of agriculture, eliminating duplication of effort, avoiding unnecessary expense, and greatly improving the service. These States are: Maine New Jersey, West Virginia, Ohio, Indiana, Illinois, Michigan, Wisconsin, Iowa, Missouri, Arkansas, North Carolina, Georgia, Alabama, Oklahoma, Nebraska, Utah, Nevada, and Idaho, close cooperation is maintained with State colleges of agriculture, Extension Services, Horticultural Commissioners and State Bureaus of Markets in many other States.

Utilization of Assessors.

In thirty out of the 48 States the Bureau has been instrumental in providing for the better utilization of local assessors in the collection of acreage and live stock data annually. In a few States in which the Bureau is cooperating and where the trained field agents of the Bureau have had an opportunity to check up the assessors' returns for completeness and accuracy, we have had data which are probably far more accurate than those collected by the decennial census. There is reason to believe that this system of collecting data on acreage and numbers of live stock on farms annually by means of local assessors will be extended to all States before the decennial census of 1930.

It is to be understood, of course, that data collected by assessors for statistical purposes has no connection whatever with taxation. The development of this system of collecting primary data through assessors and checking and summarizing same by trained field agents is regarded as one of the most constructive pieces of work undertaken by the Bureau.

Enlarged Program of the Bureau.

It is, information with respect to production and supply, which is the fundamental price determining factor, which all farmers need and which all Federal and State and private agencies for promoting agriculture need to make the business of farming profitable. The war demonstrated also that there are some kinds of information of fundamental importance which the

Bureau can not supply with its present facilities. The Bureau has therefore drawn up an enlarged program for expanding and improving the crop and live stock reporting service to supply these deficiencies. The main features are:

(1) A greatly enlarged live stock program.

(2) Reports on marketable surplus production. This is the part of the crop which really determines the price. The crop estimates in the past have related to total production, more than 50 per cent of which never leaves the farm where grown. It is said that buyers use the figures of total production as a hammer to beat down farm prices.

(3) County estimates. Estimates localized by counties of crop and live stock production, both total and surplus, would tend to make the estimates more accurate and to increase confidence in them because every farmer can then judge as to whether or not the estimates for his county are accurate and dependable.

(4) Foreign crop estimates. The law of supply and demand which determines prices is not limited to any county or State, but is world wide.

(5) More complete and better summarization, analysis, interpretation and presentation of agricultural statistics.

Other Proposed Features.

(1) The Bureau also proposes to estimate and report in advance of the planting season the intention of farmers to plant.

(2) Estimates of such essential factors as farm labor, seed, fertilizer, insecticide and fungicide, and farm machinery and equipment requirements.

(3) Acreage and production by varieties.

(4) Estimates of abandoned acreage for all crops.

(5) Estimates of grade or quality showing the relative value of the crops produced.

(6) Estimates of sale, disposition or utilization of entire crop.

(7) Estimates of shrinkage and loss in storage.

Appropriations for the Bureau of Crop Estimates.

Following are the total appropriations made by Congress for the Bureau of Crop Estimates since 1912:

1913	$240,892
1914	243,680
1915	275,580
1916	283,480
1917	316,436
1918	385,288
1919	463,272
1920	371,102
1921	318,656

BUREAU OF CROP ESTIMATES.

Activity - Unbiased, authoritative and dependable estimates of acreage, yield per acre, total production, numbers of live stock, farm prices, factors and forecasts of production and relative supply of:	Annual or estimated value on farms of crops and live stock.	Amount of Federal funds available in 1920 for crop reporting and statistical service.	Estimated return to farmers, actual and potential, direct and indirect, of service.		Percentage of estimated value of return to cost of service.
			Per cent of crop value.	Amount.	
Cereal Crops - Corn, wheat, oats, barley, buckwheat, rye, rice, and grain sorghums	$7,771,482,000	$140,634	.1	$7,771,400	5,526
Hay and Forage Crops - Pastures, grass, clover, alfalfa, millet and other tame hays, and wild hays	2,741,657,000	26,404	.15	411,200	1,557
Live Stock - Horses and mules, dairy cattle, dairy products, other cattle, sheep, wool, swine, poultry and eggs	10,975,671,000	33,720	.028	3,098,200	9,188
Truck Crops - Tomatoes, lettuce, celery, onions, cabbage, cantaloupes, sweet corn, watermelons, green beans and peas, cucumbers, asparagus, and other vegetables	185,429,000	42,182	1.0	1,854,400	4,396
Fruit Crops - Apples, pears, quinces, peaches, apricots, plums, prunes, cherries, citrus, grapes, strawberries, raspberries, blackberries, dewberries, loganberries, currants, gooseberries, cranberries, figs, pineapples, olives, and other fruits	530,401,000	40,612	1.0	5,304,000	13,060
Potatoes (white and sweet)	595,000,000	16,744	1.9	5,950,000	35,535
Sugar Crops - Sugar beets and cane, sorghum, maple sugar and syrup, and honey	157,000,000	4,790	.1	157,000	3,278
Cotton (lint)	1,587,445,000	29,141	.5	7,937,200	27,237
Tobacco	375,000,000	12,075	.5	1,875,000	15,528
Legumes - Beans (dry), soy beans, velvet beans, cowpeas, peanuts	246,468,000	5,715	.5	1,232,400	21,564
Miscellaneous Crops - Broom corn, hops, hemp, flax, etc.	50,000,000	2,093	.5	250,000	11,945
Furnishing statistics of all crops and live stock, foreign and domestic	.....	16,992	....	159,200	937
	$25,215,553,000	$371,102	.14	$36,000,000	9,701

UNITED STATES DEPARTMENT OF AGRICULTURE

June, 1920

BUREAU OF ENTOMOLOGY

L. O. Howard, Chief

Scope of the Work.

The Bureau of Entomology investigates the life history and habits of insects injurious or beneficial to agricultural and horticultural crops, forest and shade trees, and other crops and products, and those affecting domestic animals and the health of man, and ascertains the best means of destroying those found to be injurious. Its activities cover a very wide scope, and information can be furnished by the bureau on practically all subjects relating to general and economic entomology.

Many important insect problems have been investigated in the past and engage the attention of the bureau at the present time. About 150 distinct lines of inquiry are now under way, including probably not less than 500 different insect pests. The various activities are grouped according to crops and constitute several branches, or divisions, each in charge of a specialist.

Deciduous Fruit Insect Investigations

This office is concerned with insect pests attacking orchards, vineyards, nut crops, and certain small fruits. Special investigations have been made, or are under way, of the principal pests of the apple, peach, grape, cranberry and the like. These include the codling moth, plum curculio, grape berry moth, San Jose scale, pear thrips, etc.

The codling moth is being studied at field stations in various parts of the United States to develop satisfactory spraying schedules for the principal apple-growing regions. Experiments in the control of the grape-berry moth in northern Ohio have resulted in an effective spraying schedule for vineyards in that territory, and thousands of acres of vineyards are now being sprayed according to bureau recommendations. Studies of pecan insects in the South have resulted in the accumulation of much information concerning these pests and in developing measures for the control of most of them, with material benefit to the pecan industry. Investigations of the pecan tree borer appear to indicate that an effective and cheap control has been found in the use of para-dichlorobenzene as a fumigant around the base of

the trees. The species of apple-tree borers have been studied and conditions under which they are most injurious ascertained. Many other fruit pests are under investigation, and control measures will be ascertained.

This office is also charged with investigation of the general subject of insecticides. Investigations of the insecticidal constituents of plants are under way, the arsenicals as a group, and the mineral oils. An insecticide pharmacopoeia is being compiled and other activities of interest to users and manufacturers of insecticides are in progress.

This office, in cooperation with the New Jersey Department of Agriculture, is also charged with control operations against a new serious pest, the Japanese beetle, which was recently introduced from Japan and has become established in 15,000 acres in the vicinity of Riverton, N. J.

Cereal and Forage Insect Investigations

Studies of the Hessian fly, chinch bug, alfalfa weevil, joint worms, grasshoppers, cutworms, etc., are some of the important activities coming within the field of work of this office.

The great wave of Hessian fly infestation which spread over the wheat belt during the period from 1914 to 1916 was foreseen by bureau entomologists and warnings were distributed broadcast, together with definite information on how best to avoid the ravages of this pest, such as by late planting, etc., resulting in vastly increasing the wheat crop of 1915.

Extended investigations have been followed by complete success in perfecting and applying poison baits for the destruction of injurious grasshoppers, resulting in immense savings in crops.

This office, in cooperation with the Federal Horticultural Board, is charged with measures for the control of the recently introduced European corn borer, and an effective organization has been formed for carrying out this important work.

Truck Crop Insect Investigations

This office devotes attention to all insect pests of truck and garden crops, and has accumulated a large amount of data concerning the life histories and methods of control of these pests.

Investigation of the potato tuber moth in the Pacific Coast States has resulted in control measures greatly reducing its injuries. Remedies for the important insect pests of sugar beets, such as wireworms, webworms, etc., have been developed, greatly stabilizing the industry. Methods of control

of the onion thrips have been evolved, as well as satisfactory treatment for cutworms, etc. This office is conducting a campaign of control and eradication in the Southern States of the sweet potato weevil, which has seriously injured sweet potatoes in the South during the last few years.

Southern Field Crop Insect Investigations

The insect enemies of cotton, tobacco, sugar cane, rice, etc., are studied by this office, special attention being given to the insect enemies of tobacco.

A satisfactory dry poison for the hornworm has been developed, and distinct progress has been made in the development of methods for the control of the sugar-cane borer. A discovery of the greatest importance to cotton growers and to the Nation at large has been the possibility of greatly reducing boll weevil damage by the dusting of cotton plants with powdered arsenate of lime. This work, which heretofore has been experimental, has now been established on a demonstration basis and is rapidly coming into use by cotton planters. The demand for arsenate of lime and cotton dusting machinery now exceeds the available supply.

Preventing Spread of Moths

The work of this office relates to preventing spread of the gypsy and brown-tail moths, for years present over portions of the New England States.

Headquarters for this work is near Boston, Mass., in the heart of the infested territory. Marked success has followed efforts to retard the spread of the gipsy moth. The area infested in 1914, 18,633 square miles, has been held to an area of 21,998 for 1918. The numerous parasites and predatory enemies of the gipsy and brown-tail moths introduced from various parts of the world have already shown themselves to be factors of great importance in the control of these insects. The bureau devotes special attention to the insects on the margin of infestation and the various State authorities assume charge of their reduction well within the area infested. In cooperation with the Federal Horticultural Board there is also maintained a strict quarantine of materials likely to disseminate these insects.

Tropical and Subtropical Fruit Insect Investigations

The various mite and scale insect enemies of citrus trees--the orange white fly, and various pests of other subtropical fruits, including Mediterranean and other fruit flies--are investigated in this office.

Effective control measures for citrus scale pests and the orange white fly in Florida have been developed by the use of appropriate sprays, and a spraying schedule for orange groves has been perfected and is now in large use by growers. In connection with the treatment of citrus pests in California a decided improvement has been made in the use of hydrocyanic-acid gas for the destruction of such pests as mealy bugs and other scale pests. This improvement places the employment of this valuable insecticide on a practical and scientific basis.

Detailed information on the Mediterranean and other fruit flies in Hawaii and elsewhere has been accumulated, which is of the greatest importance to fruit growers in the United States should those pests ever become established in this country. A study is in progress of the camphor thrips, which has recently caused considerable damage to camphor plantings in the South.

This office is also charged with investigations relating to insects injurious to greenhouse plants. The bureau's studies of greenhouse insects have already resulted in important savings to florists.

Stored Product Insect Investigations

This office studies the various insects destructive to food and other stored products, as well as clothes, such as the granary weevil, corn-meal moth, Angoumois grain moth, clothes moth, caret beetles, and household insects such as roaches, bedbugs, etc.

Work is done in various parts of the country to demonstrate methods of prevention of weevil injury to stored grains. Contacts have been established with mill men and assistance rendered in the protection of mill products from insect attack. During the war there was cooperation with the War Department to prevent damage to military supplies and stored products at large supply bases.

Apiculture

The apiculturist of the bureau is conducting a nation-wide campaign to increase honey production as an aid in meeting the shortage of sugar.

Numerous problems of the beekeeper are receiving attention, such as better care of bees during the winter, the utilization of adequate hives, the detection and treatment of bee diseases, and the like.

Insects Injurious to Health of Man and Domestic Animals

In this section, specialists are giving attention to a large number of insects of great importance to the human and to growers of live stock.

For example, satisfactory treatment of manure to prevent fly breeding has been developed. A specific study of the economic importance of malaria in the South and losses to the planters resulting from invalidism due to this disease has been made.

Forest Insect Investigations

The forest entomologist is concerned with Scolytid beetles and various other insects injurious to forests, shade trees, and forest products.

A large amount of information has been accumulated concerning these insects, and remedial measures have been developed. The Dentroctonus beetles, which constitute a serious menace to standing pine, spruce, and Douglas fir timbers of the Rocky Mountain and Pacific Slope States, have been shown to be controllable to a large degree. Work done in the Yosemite National Park during the last three years has resulted in almost complete eradication of these beetles in yellow pine and sugar pine areas.

Operations carried out on Long Island, New York, against the hickory bark beetle and the two-lined chestnut borer in oaks have resulted in a great reduction of these two pests, which were threatening the hickories and oaks of the island. The damage to forest products by powder post beetles has been diminished greatly through the adoption of methods recommended by the bureau.

Very important investigations of the relation of altitude, longitude, and lititude to the periodical activities of insects and their host plants have been made and a publication issued to show a bioclimatic law, which it is believed will have broad application, not only to entomological research practice, but to all periodical practices in agriculture.

Specific Services

Under this classification may be included the identification and classification of insects, which is of a basic nature and is the foundation upon which all of the economic work of the bureau rests.

The specialists in this service are recognized as leading authorities on the various species of insects. Many specimens are received from experiment stations and individuals throughout the United States and many

foreign countries, the exact identification of which is a matter of the greatest importance as a basis for remedial or eradication work.

The Bureau of Entomology is not charged with specific and regulatory duties, but cooperates in work of this kind with other organizations in the department. The Assistant Chief of Bureau, C. L. Marlatt, is Chairman of the Federal Horticultural Board and another member of the bureau also serves on this board, while still another bureau official is a member of the Insecticide and Fungicide Board.

UNITED STATES DEPARTMENT OF AGRICULTURE

June, 1920.

OFFICE OF FARM MANAGEMENT AND FARM ECONOMICS

H. C. Taylor, Chief.

During the past year the Office of Farm Management has been reorganized, the scope of its work broadened, its name changed to "Office of Farm Management and Farm Economics", and its relations with the other Bureaus in the Department of Agriculture established on new lines of division of labor and cooperation.

As now organized, the Office of Farm Management and Farm Economics is charged with the investigation of the economic aspects of agriculture and agricultural problems (with the exception of marketing). The economic aspects of agriculture are understood to include such subjects as choice of enterprises and size of undertaking, cost of production and prospective returns, efficiency and economy of farm organization, farm credits and farm finance, relation of prices and market facilities to farm organization, effective use of labor and equipment, land tenure, and the problems of making farm life attractive.

At the same time that the above field was agreed upon as that in which the Office of Farm Management and Farm Economics should be responsible for results, it was also determined that the Office of Farm Management and Farm Economics should cease to be responsible for investigating any biological or physical aspects of agricultural problems but would investigate only the economic phases. If the whole subject of farm management, as broadly conceived to include all of the forces operating in the farmers' environment which affect his activities as farm manager, are to be adequately treated, the work must not be confined to one bureau but undertaken as a cooperative project of the many bureaus of the Department, each of which should contribute that phase which corresponds to the scientific training of the men in the Bureau.

Cooperation with Bureaus

With the work of the Office of Farm Management and Farm Economics thus defined, it became obvious that in order to accomplish the results originally conceived for the Office of Farm Management, it is necessary that the many Bureaus of the Department cooperate in such a manner as to bring about a comprehensive answer to the various questions arising on the farm. Therefore, in the study of agricultural problems involving economic as well as

biological and physical factors, the investigations will be undertaken co-operatively by the responsible bureaus, wherever practicable. Especially in the complex problems of farm organization and of land utilization, co-operation is fundamental to the most efficient investigation.

The responsibility for determining the cost of production of farm products has been definitely placed in the Office of Farm Management, but wherever practicable the work is to be conducted cooperatively with the bureaus most directly concerned.

Responsibility for studies in the economic history and geography of agriculture remain in the Office of Farm Management, but in this work the Office is in close cooperation with the other bureaus.

It is believed that the work of the Office can be very much strengthened by the very close cooperation of those engaged in farm economic investigations in the various States. The work of the Office of Farm Management and Farm Economics is carried on in cooperation with the State agencies engaged in like investigations wherever such cooperation can be secured.

The following outline gives a birdseye view of the research work of the Office of Farm Management and Farm Economics as planned by the committee on reorganization about one year ago:

Outline of Research Work in Farm Management and Farm Economics as Recommended by Special Committees on the Reorganization of the Office of Farm Management.

I. Cost of production-
   1. Financial records
   2. Enterprise records
   3. Complete cost records
   4. Price relations
   5. Basic unit factors of cost

II. Farm organization-
   1. Types of farming
      a. Determination of enterprises
      b. Plan or combination of enterprises
   2. Size of business
   3. Farm plan or layout
   4. Effective use of labor and equipment
   5. Intensity of Production
   6. Business methods

III. Farm finance-
   1. Methods of financing
   2. Insurance
   3. Taxation
   4. Other financial relations

IV. Farm labor-
1. Supply and movement
2. Trend of population
3. Living and housing problems
4. Creating new productive enterprises for farm labor
5. Standards of supervision and compensation for farm labor

V. Agricultural history and geography-
1. Trend of agricultural development
2. Shifts of agricultural production
3. Relation of American to foreign agriculture
4. Supervision of Atlas

VI. Land economics-
1. Land resources
2. Land values
3. Land ownership and tenancy
4. Land settlement and colonization
5. Land policies

VII. Farm life studies-
1. Rural home life.
2. Opportunities for social contacts in typical rural communities
3. Rural organization
4. The relation of educational and religious institutions to farm-life problems
5. The relation of health and the various forms of disability to rural welfare
6. Social effects of the various types of farm labor, tenancy and landlordism.

While work is now in progress in all of these seven lines of research, especial attention is being given to cost of production, farm organization, land economics and farm life studies. The work in farm finance has been confined during the past year to cooperative farm insurance, but attention is to be given to farm credit during the coming year. Owing to lack of funds only very small beginnings have been made in the study of the farm labor problem which is believed to be one of first importance and which should receive very special attention in the near future. Work in agricultural history and geography is progressing.

Cost of Production Studies.

During the past year 175 cost records were taken on sugar-beet farms in Utah and Idaho. A sugar-beet cost study was conducted in this general region in 1915. An investigation relating to the cost of producing the 1919 wheat crop was completed last autumn. A preliminary report, showing the range in cost per unit for individual farms, together with average acre costs by districts for farms in the winter and spring wheat regions, has been issued.

This will be followed with a more detailed bulletin that will give special attention to the essential factors of wheat production costs. Last year considerable time was devoted to a study of the cost of producing cotton in ten representative Southern counties. Preliminary and complete reports have been prepared with reference to the cost of growing cotton in 1918. At the present time a survey is in progress in the cotton belt for the purpose of securing cost figures on cotton and farm organization data on the farms which were visited last year.

Farm Organization Analyzed

Farm organization work deals particularly with a detailed analysis of the farm business. In several acres surveys embracing the farm business analysis have been conducted from year to year, thereby giving a connected record of the results obtained by these individual operators. In a few districts surveys have been repeated, following the lapse of a brief period, varying from four to ten years. A survey for a single year represents a third method which has been employed by this office. Within the fiscal year, surveys were conducted in the following districts:

Two general crop and live-stock areas in Iowa (400 records).

A citrus fruit area and a truck area in Florida (300 records).

A general farming area in New Hampshire (136 records).

A general farming district in Ohio (50 records).

A general farming and fruit area in Virginia (100 records).

A general farming area in Ohio in cooperation with the Ohio College of Agriculture (100 records).

Slightly more than 1100 records were taken in connection with our studies of the business of the farm as a whole.

Farm Financial Relations

Special attention in this project has been given in recent months to forms of insurance applicable to farm risks. A suggested State law for the organization and regulation of farmers' mutual fire insurance companies was recently published. A simple and practical system of records for such companies has been devised and is being introduced. Problems connected with crop insurance for farmers have been studied and data on the subject is being prepared for publication. Information and advice has also been given through correspondence and public addresses in regard to windstorm and live stock insurance, as well as insurance against fire. Rural credits and farmers' mutual telephone companies have been given such attention as facilities permitted.

Farm Labor Investigations

The Office has been forced to limit its activities along this line to work in the Wheat Belt. Field men from the Office are following the harvest and cooperating with State agencies in the campaign for recruiting harvest hands. At the same time they are making a study of the character of the labor demand in this region, the kind of men who are attracted to the work, the proportion of their time employed, the relations of the employers and the employees, and many other economic questions related to the problems of securing an adequate supply of effective labor.

Agricultural History and Geography.

This section is engaged in five lines of work:

The first project undertaking is entitled, the "Trend of Agricultural Development in Relation to Prices and Production." This involves a study of the history of agricultural production and prices, with a view to interpreting present conditions and to determining the causes of changes in production and price.

The second line of work deals with the relation of American to foreign agriculture. It is studying the effects of foreign competition upon production in this country, and in cases in which the production of foreign countries largely determine the prices of the product; it is investigating the resources and the trend of development in the important producing countries.

The third field of investigation is the distribution of farm enterprises as affected by topography, soils, climate, geographic location and economic conditions.

The fourth line of work in this section, relates to the geography of farm practices, labor requirements, and the seasonal distribution of labor. In this project, maps are being prepared of the various practices in the production of crops and live stock, and the causes underlying the geographic distribution and variations in these practices are being studied.

Land Economics.

The work of the Division of Land Economics falls into three main groups, as follows:

First:- The study of the tenant contract under different systems of farming, to determine what terms of agreement are most favorable to harmonious relations, good agricultural practice and a fair division of returns.

Second:- Studies in the present tenure of land in the United States and existing tendencies in respect to concentration of land-ownership, the increase of tenancy and the causes and effects thereof, and possible measures for developing a satisfactory relationship of the farmer to the land.

Third:- Studies of undeveloped regions to ascertain their agricultural possibilities and limitations, the ownership of the land, land values, methods of settlement and colonization, and conditions favorable to the success of the settler in adjusting himself to his new environment.

Farm Life Studies.

The section of Farm Life Studies has completed the field work in a study of the social effects of tenancy on 100 farms in North Dakota, and on 400 farms in Missouri, and has similar studies under way or about to be begun in Maryland, Nebraska and Iowa. Field work has been completed in a community analysis of a New York community of 1,000 farms, and community studies are in progress in West Virginia, Georgia and South Carolina. A study of the social effects of farm sales has been made in five counties in Indiana. A bulletin based on a study of 200 community houses has been submitted for publication. A directory of American Agricultural organizations has been compiled, and is now in press.

UNITED STATES DEPARTMENT OF AGRICULTURE

June, 1920.

FEDERAL HORTICULTURAL BOARD

C. L. Marlatt, Chairman.

The Federal Horticultural Board was created August 21, 1912, to assist the Secretary of Agriculture in the enforcement of the Plant Quarantine Act of August 20, 1912. It is composed of five members, two representing the Bureau of Entomology, two the Bureau of Plant Industry and one the Forest Service.

The Plant Quarantine Act empowers the Secretary of Agriculture to prohibit or regulate the entry of foreign plants and plant products to prevent the entry into this country with such plants and plant products of new and dangerous plant pests, either insect enemies or plant diseases.

It also empowers the Secretary of Agriculture to establish and maintain quarantined districts within the United States for the purpose of preventing the spread of plant enemies or diseases which may have gained local foothold, and to cooperate with the States in measures looking to the extermination of such pests. For this purpose its powers are even broader than plants and plant products, inasmuch as it may control the interstate movement of any article of any character whatsoever capable of carrying any dangerous plant disease or insect infestation.

Regulation of Entry of Foreign Plants and Plant Products.

Under this act, some twenty-eight quarantines and restrictive orders, prohibiting or regulating the entry of foreign plants and plant products, are now being enforced. These quarantine and other orders are for the purpose of excluding such pests as the Mediterranean and other fruit flies, the pink bollworm and other cotton pests, serious diseases of potatoes, cereals and other important crops.

Domestic Quarantines.

There are now being enforced some twelve domestic quarantines controlling the interstate movement of plants and plant products. These have for their object the prevention of spread within the United States of such plant and forest enemies as the gipsy moth and the brown-tail moth, the pink bollworm of cotton, the date palm scale insects, the Japanese beetle, the European corn borer, the white pine blister rust, and the potato wart.

Control of Particular Plant Enemies.

In addition to its quarantine activities, the Board is concerned, in large scale, control operations against particular plant enemies, either directly or in cooperation with other bureaus under special appropriations

of Congress to affect the control and, if possible, extermination of such pests as the pink bollworm of cotton, the Japanese beetle, the gipsy and brown-tail moths, the European corn borer, the sweet potato weevil, the citrus canker, the potato wart disease, the white pine blister rust, and the black stem rust, flag smut, and take-all diseases of wheat.

The Port Inspection Service.

For the enforcement of its various quarantine and regulatory orders, the Board is now developing and maintaining a port inspection service at the principal ports of entry of the United States. This service involves complete control of the entry of products brought under regulation, as , for example, all nursery stock and other plants and seeds, import plant material such as cotton, the importation of which amounts to approximately fifty million dollars worth annually, the importation of corn and small grains, and a number of other minor plant products. With respect to the exclusion of the pink bollworm from Mexico, it maintains a border port inspection service along the entire Mexican border - a service which regulates the entry of all imports from Mexico and directs and supervises the disinfection of railway cars and freight, express, baggage and other materials entering from Mexico, to prevent the entry with such cars and materials of cotton seed or other carriers of the pink bollworm enemy of cotton. This Mexican border service involves some seven ports of entry.

Research Work.

The Board from time to time also cooperates with the other bureaus of the Department in research investigations to secure information necessary for the proper determination of quarantine or other necessary regulations with respect to both foreign plant pests and to such pests of local establishment in the United States. Such research work of the Board has had relation to most of the special subjects enumerated above and is undertaken by the Board only when the other bureaus of the Department are not able to give the necessary information and cannot from the status of their appropriations and other commitments undertake the necessary investigational work.

Foreign Cooperation.

Some thirty foreign countries have enacted legislation and appointed inspection and other officials to cooperate with the Deoartment of Agriculture

in the enforcement of the regulations and quarantines under the Federal Plant Quarantine Act.

State Cooperation.

The quarantine and other officials of the several states have been brought into a general organization for aid and cooperation in the enforcement of the Federal Plant Quarantine Act and, some seventy such state officials are now connected with the work of the Board as collaborators of the Department of Agriculture and very materially assist in the enforcement of the Federal quarantine and regulatory orders.

Results.

The upwards of seven years of enforcement of the Federal Plant Quarantine Act has prevented the entry of a very large number of new pests of the farm, orchard, and forest. The number of foreign pests which have been intercepted with plant and plant product importations, of which a fairly accurate record has been kept, makes a very imposing list--many thousands of different interceptions covering a range of hundreds of new pests.

UNITED STATES DEPARTMENT OF AGRICULTURE

June, 1920.

FOREST SERVICE

W. B. Greeley, Forester.

The main task of the Forest Service is administering and protecting the National Forests. The following summary and condensation of the various appropriation items providing for Forest Service activities during the coming year show whence its funds are derived:

For specific salaries (including many of the Forest officers) and for additional Forest officers payable from a lump-sum fund	$2,503,380.
For general expenses (mainly also salaries and wages) incident to the use, maintenance, improvement, and protection of the individual National Forests	2,100,262.
For fire fighting and prevention on the National Forests	300,000
For cooperation with States in protection of the watersheds of navigable streams against forest fires	125,000.
For various specified purposes in connection with reforestation, timber sales, land classification, etc., on the National Forests	287,640.
For roads, trails, bridges, fire lanes, telephone lines, cabins, etc., on the National Forests	400,000.
For investigations and experiments of various kinds, and for field, office, and laboratory supplies, instruments, and equipment	489,540.
Total--	$6,305,822.

There are 154 National Forests, containing 154,658,372 acres of Government-owned land. Most of the Forests were created from public lands in the Rocky Mountain and far western States, but there are two in Arkansas, two in Minnesota, one in Florida, and one in Michigan, while a number are being built up through land purchases in the White Mountain and Southern Appalachian regions.

Holding Down Fire Losses

Protection of the National Forests against fire is in itself a difficult task. The protective system has been devised to meet the conditions imposed by great areas of rough mountain lands, with few inhabitants, scant means of communication and transportation, protracted seasons of drouth, many lightning storms, and far too many man-caused fires. Protection includes fire prevention, detection, and suppression.

To prevent fires, cooperation of the public is sought; railroads, timber operators, settlers, stockmen, campers, etc., are required to comply with special regulations, and otherwise induced to use care with fire; inflammable slash is disposed of; and much else. Detection is handled chiefly through patrol, stationary lookouts on high points, and cooperation of various kinds. Suppression is mainly a matter of organization and advance planning for rapid concentration of fire fighters when a fire breaks out, in whatever numbers the size of the fire may demand, and for provisioning and otherwise maintaining them until the fire is under control. In such plans, of course, progressive equipment of

the Forests with roads, trails, and telephone lines holds an important place.

In administering the Forests, one of the aims is to develop these great public properties so that they will contribute their utmost to the settlement and upbuilding of their regions. Every form of use is encouraged if it is not injurious to future productivity or to other forms of use. Uses which conflict are adjusted and harmonized on the basis of the best public interest.

Timber Business of the Forests

The total saw timber stand of the National Forests is estimated at about 500 billion board feet. The yearly cut is over 800 million board feet. More than 100 million feet is cut under free use, chiefly by farmers, 20 million is cut under cost sales to farmers, and 700 million is cut under commercial sales. Receipts from timber total nearly $2,000,000.

In making commercial sales the full value of the stumpage is secured through a system of careful appraisal to fix a fair and sufficient minimum price, followed by advertisement and competitive bids. Active competition of purchasers is sought. At the same time care is taken to prevent purchasers from obtaining timber in such quantities or locations that they will have a monopolistic control of certain local markets. In this and other particulars, the essential principle is illustrated, that the Forests are administered not as purely commercial enterprises but as real public utilities, to promote the general welfare as fully and in as many ways as possible.

The timber in the National Forests also furnishes a check on future timber monopoly in the far West as existing supplies grow less through cutting. The total stand forms about one-fifth of the total stand of the country. The cut, however, is as yet trifling in comparison with the normal annual cut of the entire country which, for lumber along, is 40 billion board feet, and for all purposes, 26 billion cubic feet. Most accessible of the western timber passed into private ownership before the National Forests were created.

Settlers living within or near the Forests can obtain up to $20 worth of dead or down timber free of charge. Green timber can be purchased by farmers at the actual cost to the Forest Service of making the sale - usually around $1 per thousand feet. All timber is cut in accord with plans for the perpetuation of the forests and a sustained yield of timber. Special care is taken to safeguard supplies for meeting present and future local needs. Thus both industries dependent on National Forest timber supplies and the lumber industry itself, to the extent that it utilized the Forests, are made stable, thus exhaustion of the resource followed by migration of the industries and depopulation is avoided. The lumber camps furnish a ready market for farm produce and afford occupation for the farmer and his teams when work on the farm is slack.

Grazing Resources Of The Forests

The National Forests furnish summer range for approximately 2,375,000 head of cattle and horses and 8,500,000 head of sheep and goats, not counting lambs or calves under six months old. Receipts from grazing fees total about $2,500,000 yearly.

Much of the stock is owned by farmers living near the Forests. Monopoly of the Forest ranges by large owners is now allowed. Out of 32,528 permits for cattle and horses issued by the Forest Service, 27,806 were to persons who grazed 100 head or less. The advantage to western farmers of being able to run their livestock on the Forest ranges in summer is very great. Many small farmers obtain their most important cash income from such livestock.

When the National Forests were created the ranges had lost much of their carrying capacity through overgrazing, and were rapidly growing worse. To restore them to normal productiveness without serious disturbance of the western livestock industry was a great problem, of a new kind. No one then knew how such a thing could be done, and the basic scientific knowledge of the range vegetation and the effects of different kinds, periods, and methods of grazing had never been gathered.

Remedial measures were rapidly devised that proved efficacious for stopping the damage and beginning the restoration of the range to productivity. Hand in hand with application of these measures went increasingly close study of every phase of range management and of livestock management on the ranges. The result has been to create a new science and practice, applicable not merely to the National Forests, but to livestock production on range lands generally. Both the carrying capacity of the ranges and the value of their livestock produce have been very markedly increased. Much of the stock now requires no fattening and goes direct from the range to the slaughter house.

Water

One of the most important functions of the National Forests in their relation to the farmer is that of watershed protection. Practically every stream of importance that is used for irrigation in the western States has its source in a National Forest and depends, for a steady flow of water, upon the maintenace of a forest cover on the steep mountain slopes.

In making plans for handling the National Forests this fact is recognized, and precautions are taken to prevent over cutting, which would reduce the timber below the danger point, or overgrazing, which would result in erosion. The National Forests also protect the water supplies of some 1,200 western cities and towns. Sanitary regulations are enforced by the Forest Service to safeguard such water supplies.

Recreational Facilities

Many thousands of farmers as well as city folk from the prairies and plains go for summer trips by automobile or train into the National Forests.

In California a recreation area has been developed for the farmers of the

Imperial Valley in the nearby Laguna Mountains, where they and their families can go to escape the oppressive and unhealthful summer heat. At innumerable places, such as in White Mountains in the East and Colorado in the west, the people go into the Forests by automobile, wagon, on horse-back, or on foot for delightful outings. Some go merely for a day's picnic, others to spend a week end, while still others camp, possibly for months, at some favorite spot far back in the mountains, or make long pack trips over the Forest trails.

"Selling" Forestry To The Country.

Although the care of the National Forests is the chief activity of the Forest Service, the greatest need of the country today is better care and use of the forests in private ownership.

Forest depletion has progressed until it menaces the future of many industries and already imposes a severe burden on the public generally. Only one-sixth of our original 822 million acres of virgin forest is left. With a total yearly consumption of about 26 billion cubic feet of timber, we grow less than one-fourth of this amount; and we are cutting heavily not only into out remaining virgin forests but also into the smaller material that is growing up in its place.

The Northeast is nearly cut out even of local supplies of saw timber. The Lake States do not begin to supply their own needs, In another ten years the South will cease to produce more pine than it consumes locally. Douglas fir from the Pacific Coast has within the last three years become an important factor in the markets of the Northeast, a main dependence of the Lake States and central West, and has even invaded the markets of the South. The hardwood industries turning out such products as agricultural implements, handles, vehicles, and furniture are now cutting their last large source of supply, in the lower Mississippi Valley.

The only possible remedy is public action to prevent abuse and destruction of the timber resource itself. Some 81 million acres of forest land unutilized for farming or any other purpose have been so severely cut and burned as to be an unproductive waste. An enormous additional area is producing so little or so poor timber that its importance is negligible.

To meet this situation the Forest Service has undertaken a compaign of public information, and has proposed a definite program of which the main features are:

1. To enlarge the work of fire protection in cooperation with such States as will at least equally share with the Government in the public costs, require the owners of forest lands to contribute approximately one-half the total cost of fire protection, and use the police power of the State to stop forest devastation through equitable requirements covering the utilization of forest lands.

2. The extension and consolidation of Federal Forest holdings through purchases, land exchanges, and the stopping of alienation, except under the mineral laws of all Government-owned lands valuable chiefly for the production of timber or the protection of watersheds.

3. Reforesting the denuded lands in the National Forests.

4. A federal survey and classification of forest resources in the important forest regions, in relation to present and future consumption requirements of various kinds.

5. More extensive forest research as a basis for the best management of forest lands.

6. Provision by the individual States for the building up of State and municipal forests.

7. Adjustment of existing methods of taxation to further the growing of timber crops.

The better handling of farm woodlands is one of the objects to be sought in connection with this newly inaugurated compaign. More of the farming area of the United States is devoted to wood than to any other crop, but the average production per acre is very small. One result of forest depletion has been to create a new demand for high-grade material from farm woodlands. The farmer's marketing problem in connection with the handling of his timber has been given special study by the Forest Service, along with the methods by which full productiveness may be secured. The results of many of these studies have been published, and the Forest Service is earnestly seeking ways to promote the intelligent practice of forestry on the farm.

Research Activities

In connection with its other activities, the Forest Service makes extensive and careful studies of trees and forests and the effect upon them of climate, fire, grazing, lumbering, and other factors.

The Forest Products Laboratory at Madison, Wisconsin, investigates the strength and durability of different kinds of wood, the uses to which each kind is best adapted, and the best methods of preserving, seasoning, and treating timber. These studies are fundamental to progress in the practice of forestry and the best use of wood and other forest products.

UNITED STATES DEPARTMENT OF AGRICULTURE

June, 1920.

INSECTICIDE AND FUNGICIDE BOARD

J. K. Haywood, Chairman

Scope of the Work.

The duty of the board is to aid the Secretary of Agriculture in the enforcement of the Insecticide Act of 1910. The Insecticide Act of 1910 is a Federal enactment designed to prevent the manufacture, sale, or transportation in interstate commerce, of adulterated or misbranded insecticides, fungicides (including disinfectants), lead arsenates, and Paris greens; to prevent the importation of such misbranded and adulterated articles into the United States, and their exportation from the United States. Under the provisions of the act the Government is empowered to proceed criminally against persons who ship into interstate commerce, or sell or offer for sale in the territories or the District of Columbia, insecticides and fungicides which are adulterated or misbranded, under the provisions of the act.

The Government is further empowered to seize any such misbranded or adulterated articles which are being transported interstate for sale, or which having been so transported remain unloaded, unsold, or in original unbroken packages, and may seize any such misbranded or adulterated articles which are manufactured, sold or offered for sale in the District of Columbia or any territories of the United States.

The act further authorizes the Government to refuse entry into the country of any adulterated or misbranded insecticides and fungicides, or any such articles that are forbidden entry into, or forbidden to be sold, or restricted in sale in the country in which they are made or from which they are exported, or any such article that is otherwise dangerous to the health of the people of the United States.

Penalties are provided, consisting of fines for a first offense and fines or imprisonment, or both, for a second offense.

Some Principal Features of the Act.

(a) Definite standards for lead arsenate and Paris green.

(b) The law requires, for all insecticides (other than Paris greens and lead arsenates) and fungicides which contain inert ingredients, that a statement shall be placed upon the face of the principal label of each and every package giving the name and percentage amount of each inert

ingredient and the fact that it is inert, or, in lieu of this, a statement of the name and percentage amount of each active ingredient, together with the total percentage of inert ingredients.

(c) For insecticides (other than Paris greens and lead arsenates) and fungicides which contain arsenic or compounds of arsenic, a statement must be made on the face of the principal label of the total arsenic (expressed as percentum of metallic arsenic) and the arsenic in water-soluble forms similarly expressed.

(d) One very important feature of the law is a requirement that no statement, design or device, regarding the article or the ingredients or substances contained therein, appearing on the package or label of an insecticide or fungicide shall be false or misleading in any particular.

(e) All insecticides and fungicides must be up to the standard under which they are sold.

(f) No substance or substances shall be contained in any insecticide or fungicide (other than Paris green and lead arsenate) which shall be injurious to the vegetation on which such articles are intended to be used.

The above provisions are the most important items of the act. While there are various other requirements, not usually so important, it is by a strict enforcement of the above mentioned provisions that the consumer is largely protected against those products which will not do what is claimed for them, those products which are absolute "fakes" and those products which, while killing insects, may be injurious to the vegetation on which they are intended to be used.

Organization and Division of Work.

The Board is composed of four scientists, viz., one representing the Bureau of Chemistry, one from the Bureau of Plant Industry, one from the Bureau of Entomology, and one from the Bureau of Animal Industry.

Working under the direction of the representative from the Bureau of Chemistry is a corps of chemists, bacteriologists, and microscopists who make chemical examinations of the insecticides and fungicides, including disinfectants (other than those used primarily on horses, cattle, sheep, swine or goats), determine their composition, and determine whether or not disinfectants will do what is claimed for them.

Working under the direction of the representative from the Bureau of Plant Industry is a corps of plant pathologists, who test the efficacy claims made on various fungicide labels and in the literature, and determine whether such fungicides are injurious to the vegetation upon which they are to be used.

Working under the direction of the representative from the Bureau of Entomology is a corps of entomologists, who test all entomological claims appearing upon labels and in literature, and, in certain cases, determine whether the insecticides are injurious to vegetation when used as directed.

Working under the direction of the representative from the Bureau of Animal Industry is a corps of chemists, who examine and determine the composition of various insecticides and fungicides (including disinfectants) which are used primarily on horses, cattle, sheep, swine or goats, and also determine whether such articles will do what is claimed for them on the label and in the literature.

In addition to the various scientists actually employed by the Board, various experts in the four bureaus involved are freely consulted and aid the Board in determining whether various products which come under the act will do what is claimed for them.

Working under the Board, in all its actions as a Board, is an executive officer, whose duty it is to direct the activities of all inspectors, see that various insecticides and fungicides which appear on the market are collected for examination, attend to all fiscal and business affairs of the Board, and take all necessary action for carrying out the recommendations of the Board, including the arranging of hearings, collecting evidence, and preparing cases for reference to the Solicitor of the department.

Articles Covered by the Law.

Some of the more important articles covered by the act are insecticides and fungicides for general agricultural use, such as arsenate of calcium, arsenate of lead, Bordeaux mixture and combinations of same with insecticides, fish-oil soaps, kerosene emulsions, lice and mite killers, lime-sulphur solution and dry lime-sulphur, nicotine preparations, Paris green, Pyrethrum and hellebore powders; insecticides and fungicides con-

trolling parasitic and bacterial diseases of animals, such as dips, fly repellants, mange preparations, etc.; insecticides used in the household, such as roach, bed bug, moth and ant powders and solutions; disinfectants such as chlorinated lime, coal-tar emulsions, formaldehyde solutions, etc., and insecticides used against insects infesting man, such as head-lice and body-lice preparations.

Summary of Activities.

The law has been actively enforced since January 1, 1912, and during this time 7,982 samples have been collected and examined, 829 cases have been reported to the courts for criminal prosecution, and 76 seizures have been made. Disposition has been made of 1,394 cases by correspondence with the manufacturers, whereby claims which were faulty or too broad were corrected or removed from labels without resort to prosecution.

Various investigations have been made relative to basic facts which it was necessary to determine in order to enforce the provisions of the act. Such basic investigations have been published for the benefit of manufacturers and consumers in general and have served as a basis of the position taken by the Board in its Service and Regulatory Announcements which are issued from time to time.

When it is considered that all food-producing crops (grains, vegetables, fruits, etc.), all food-producing animals (cattle, hogs, sheep, etc.), the great cotton and tobacco crops, and wool-producing animals are all subject to the ravages of either destructive insects or fungous diseases, or both, and that growers are dependent, to a large extent, for their control upon the use of proper insecticides and fungicides, it will be realized that the proper enforcement of this act affects every individual in the Nation.

The disinfectants and insecticides used in the home and public places are also subject to the provisions of the law, so that the food we eat, the clothes we wear, and the homes we live in are all affected by the enforcement of this act.

It has been estimated that the annual losses of plant products from insect pests alone in the United States is at least $1,104,869,300. It has been further estimated that the shrinkage in live-stock values due to insect pests is in excess of $175,000,000. Taking into consideration the tremendous losses to plant products and the shrinkage in live-stock values due to fungous diseases, the total annual losses from insects and fungi in the United States is in excess of $1,500,000,000. A considerable part of this

loss can be avoided by the use of high-grade insecticides and fungicides which will do what is claimed for them on the labels.

Unless high-grade insecticides and fungicides of standard strength are used, the treatment of crops and animals will be a partial or total failure, and the grower will not only suffer loss in the price he paid for his insecticides and fungicides, but will suffer the much more serious and enormous losses caused by insects and fungi (including bacteria). To a great extent the use of proper insecticides and fungicides depends on the department's control of the same, through the enforcement of the Insecticide Act, to assure the user that the products he buys will do what is claimed for them. In other words, the department is doing for the consumer what he can not possibly do for himself.

Results of Enforcement.

As a result of the enforcement of the Insecticide Act it is probable that about 75 to 80 per cent of the labels now used on interstate shipments of standard agricultural insecticides and fungicides bear statements that are absolutely true or only slightly faulty. It is unusual to find on the market at present samples of lead arsenate and Paris green which are not in conformity with the standards for such products required by the Insecticide Act, yet 6 to 10 years ago it was a common occurrence to find on the market samples of lead arsenate adulterated with water, samples of Paris green adulterated with sand and sodium sulphate, and even, in some cases, samples of"Paris green" which did not contain any of this material.

The labels of hundreds of agricultural and other insecticides and fungicides have been corrected so as to give proper dilutions for use. The adulteration of pyrethrum powders with various substances such as sand, stems, and field daisies has been greatly reduced. The selling of lime-sulphur solutions, Bordeaux mixtures, tobacco extracts, dips, etc., under false claims relative to composition and efficacy has been greatly reduced. The grade of disinfectants appearing on the United States markets has been materially improved.

Finally, and of extreme importance to the country, the activities of the Board carried out by seizures and prosecutions have been of great service in protecting the cotton planters of the South against the purchase of low grades of calcium arsenate, which would kill or greatly injure their cotton plants when used for cotton boll-weevil control.

Indirect Results of Enforcement.

In view of the fact that the Insecticide Act of 1910 covers disinfectants, it will at once be seen that the improvement brought about in the grade and labeling of disinfectants sold on the United States market has been of material aid in assuring doctors, public health authorities, and the public in general that the disinfectants purchased by them will be effective. Thus the law is indirectly an excellent public health measure.

In view of the fact that the proper enforcement of the act results in the farmer, stock raiser, etc., obtaining high-grade insecticides and fungicides which will do what is claimed for them on the labels, the act serves as a "food conservation measure" in that greatly increased crop and livestock production can be obtained by the proper use of insecticides and fungicides.

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UNITED STATES DEPARTMENT OF AGRICULTURE

June, 1920

BUREAU OF MARKETS

George Livingston, Chief

Scope of the Work.

The United States Department of Agriculture and the State agricultural colleges and experiment stations for many years have been rendering definite assistance to farmers in the solution of problems concerning agricultural production. A few years ago, however, the necessity for devoting attention to marketing problems became apparent and an Office of Markets in the Department of Agriculture was created in 1913. This office subsequently developed into the Bureau of Markets. The function of this bureau is to assist the farmer in solving problems of marketing and distribution, as the Bureaus of Plant and Animal Industry of the Department of Agriculture have for a great many years assisted him in solving problems of production. The Bureau of Markets deals definitely with the selling end of farming and is, therefore, concerned with questions of economics and business. It has been in existence about seven years and during this relatively short time has done pioneer work in an undeveloped field.

Distribution is largely an interstate activity and involves fundamentally a multiplicity of relations with others, in which the farmer encounters conditions which deprive him of the possibility of controlling the disposition and sale of his crops. He is consequently in particular need of market information which will enable him to obtain the true value of the crops that he produces.

The work of the Bureau of Markets covers the entire United States, and it has branch offices or representatives in about fifty places.

Investigational and Demonstrational Work

Thoroughgoing investigations of existing conditions are basically necessary to improvement of marketing conditions. The Bureau of Markets studies current market conditions, the demand for specific crops, sources of supply, methods of grading, standardizing, packing and shipping farm products, transportation and storage, the nature of the commercial transactions by means of which farm products move from the producer to the consumer, waste in marketing, methods of accounting and business practice used by agencies engaged in the marketing of farm products, cooperative associations of farmers for marketing farm products, the purchasing of farm supplies, etc.

The specific commodities to which the most attention has been given are cotton and cotton seed, live stock, meats and animal by-products, dairy products, grain, hay, feeds and seeds, and fruits and vegetables.

Under a special item in the appropriation act, the bureau cooperates with the Federal Trade Commission in investigating questions relating to

the transportation, storage, marketing, manufacture and distribution of food products, with especial reference to manipulation, control of the visible food supply, and related questions. This work, so far, has been confined to live stock and the food-producing grains. A number of reports setting forth the results of the inquiries have been submitted to the Federal Trade Commission for publication.

Market News Services

The bureau conducts market news services relating to fruits and vegetables, live stock and meats, dairy products, hay, feed and seeds, and peanuts, and has recently instituted, in accordance with an amendment to the United States Cotton Futures Act, a quotation service showing the value of spot cotton.

The outstanding feature of the Market News Service is that it keeps before the producer, distributor and consumer a picture of the movement of important crops, and of the supplies arriving in all of the large consuming and distributing markets, and the wholesale prices prevailing in each.

Prior to the establishment of these market news services a few large organizations only were able to obtain reliable information on market conditions. Such information is now available to producers and to all interested parties. This protects the small producer and dealer, brings about more stable conditions and better distribution, and benefits consumers as well.

To make its reports of the utmost practical usefulness, the bureau has equipped itself with the fastest system of communication available today, and its branch offices in the great consuming and distributing markets are connected by leased telegraph lines operated by bureau telegraphers. These wires are busy from eight to twelve hours a day in the exclusive transmission of information which is vital to intelligent and successful food distribution. At one time during the war the bureau operated 17,000 miles of leased wires. These wires now extend about 5,000 miles and the mileage must be further decreased on account of reduced appropriations.

Before the news services could be successfully operated it was necessary to get the cooperation of the railroads, to obtain information regarding the carlot movement of certain commodities. At the present time nearly 1,200 agents on 474 railroads, involving 248,000 miles of road, send in reports which are used in connection with the daily telegraphic bulletins on fruits, vegetables, live stock and meats.

The Market Reporter

In addition to its daily and other bulletins, the bureau publishes The Market Reporter, a weekly periodical which gives reliable current market information, reviews of crop seasons, comparisons and other related material such as has never before been available in convenient form.

Food Products Inspection Service

The Food Products Inspection Service provides a means whereby shippers or other interested persons may obtain a prompt, full, accurate and disinterested report on the condition of their shipments upon arrival at market.

Inspections, which on account of limited funds are now confined to fruits and vegetables and butter, are made only upon formal request from some financially interested party and the reports issued by the inspectors are prima facie evidence in the courts of the United States. The certificates furnish a basis for the settlement of disputes, damage claims, etc., and the very existence of the service removes the temptation to make unjustifiable rejections and prevents many disputes which otherwise would arise.

At the present time fruit and vegetable inspectors are stationed at twenty-five markets, about 147 additional markets being served from these stations. Butter inspectors are stationed in New York, Philadelphia, Chicago and Boston.

Regulatory Work

Regulatory work is conducted by the Bureau of Markets to enforce the United States Grain Standards Act, the United States Cotton Futures Act, the United States Warehouse Act, the Standard Container Act, and, as war activities, to supervise the stock yards, and liquidate the work of the Wool Section of the War Industries Board. The bureau, in cooperation with the Solicitor's Office of the Department of Agriculture, rendered material service to the committees of Congress which were responsible for the introduction of this legislation by assisting in drafting the bills.

Cooperation with the States in Marketing Work

The Bureau of Markets now carries on cooperative marketing work with State agencies in twenty-eight States, i.e., Arkansas, Colorado, Connecticut, Georgia, Iowa, Louisiana, Maine, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Mexico, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, South Carolina, Tennessee, Texas, Utah, Vermont, Virginia, and Washington.

The work in each of these States is under the immediate leadership of a field agent in marketing, whose function it is to assist in coordinating the marketing activities of the various agencies in the State in which he is located. This work should make possible the development of a consistent national policy through which marketing improvements may be effected.

MEMORANDUM FOR AGRICULTURAL EDITORS.

Work of the Bureau of Plant Industry
June 15, 1920.

The Bureau of Plant Industry deals with numerous and varied problems affecting plants in their relation to agriculture and their utilization for various purposes. Its field is that of crop production, including such features as the investigation and development of means of control of plant diseases, or, where possible, the eradication of newly introduced plant diseases; the investigation of numerous problems involving the study of the physiological processes and reactions of the plant to environmental and cultural conditions; the breeding and improvement of crop plants; the search for and introduction of promising economic plants from those portions of the world which have older agricultural development than our own; the acclimatization and adaptation of such economic plants to our agricultural conditions; the development of improved cultural methods and crop rotations, especially with respect to those portions of the country which are agriculturally new and with regard to those crops which are new to American agriculture; the study of the reactions of crops to fertilizers, especially to the more newly introduced fertilizing materials, both beneficial and toxic, including the effects of fertilizers and crop successions on the yield and quality of special crops such as tobacco, drug and oil seed crops; the initiation and encouragement of the development of new plant industries requiring special community and other economic adjustments which are new to our conditions, such as the long staple cotton and date production activities of the Southwest; and many problems having to do with the improvement and stabilization of production of cereals, including corn and the grain sorghums; flax for seed and for fiber; the various grasses and forage crops both for harvesting and for pasture; cotton, hemp, and other fibers, including such as sisal and henequen which are essential for binder twine and cordage; potatoes and the whole range of vegetables suitable for temperate and sub-tropical climates; the entire range of temperate region and sub-tropical fruits and nuts, sugar-producing plants, such as beet, cane, sorgo, and maple; together with such special crops as tobacco, drug plants and oil producing seeds, and plants and trees possessing value as ornamentals either for out-of-door or greenhouse cultivation.

Considerable attention is also being given to certain phases of crop handling and utilization which directly concern the farmer, either through the necessity that these be done on or near the farm, or that they be undertaken to salvage valuable portions of his product which otherwise would be wasted or devoted to less profitable uses than they are capable of.

In addition to the investigational work, which is the chief function of the Bureau of Plant Industry, it prosecutes three important lines of service work having to do with plant diseases. These are citrus canker eradication in the Gulf States; blister rust control on white pine in the Northern and Western States where the white pine and other five-leaved pines constitute important timber resources; and barberry eradication for the control of black stem rust of wheat and other cereals in the Middle Western and Upper Mississippi Valley States, where that disease frequently assumes destructive epidemic proportions and does great damage especially to spring wheat. These lines of service work are to a considerable extent cooperative with the states, many of which contribute largely to the work from state or local appropriations, or through contributions from other sources.

Due to the restrictions on plant importation, resulting from quarantines laid to protect American agriculture against the introduction of destructive plant diseases and insects from foreign countries, the plant introduction work necessary for the Department to do under rigidly controlled conditions is rapidly increasing in scope and importance. To provide suitable facilities for this work a Plant Detention Station has recently been established near Washington where imported plant material requiring detention can be grown under rigid control and observation until safe to release for planting.

The appropriations for the work of the Bureau for the current and next fiscal years are summarized as follows:

Appropriations Bureau of Plant Industry.

	Fiscal Year 1920	Fiscal Year 1921
Statutory Salaries,	$ 491,280	$ 517,300
Lump Appropriation,	2,888,358	2,487,094
Total,	$3,379,638	$3,004,394

The Plant Industry appropriation is approximately 10% of the total annual appropriation for the Department in these years. The statutory salaries, which constitute approximately one-sixth of the total appropriation chiefly cover the administrative, clerical, sub-scientific, non-technical types of service.

The lump sum appropriations cover the general expenses of investigational, service and regulatory work, including travel, field and laboratory supplies, equipment, labor, and the salaries of most of the trained scientific investigators. These may be roughly analyzed as follows:

	Fiscal Year 1920.	Fiscal Year 1921
Investigational Work,...	$1958,400	$1,770,710
Service work..... (Citrus canker, blister rust control, barberry eradication)	567,048	471,088
Regulatory work (Import Seed Law).	3,930	5,880
Congressional Seed Distribution.....	358,980	239,416
Total.....	$2,888,358	$2,487,094

In addition to its specific appropriation, the Bureau of Plant Industry administers the agricultural extension work on the government reclamation projects under the appropriation for Demonstrations on Reclamation Projects which is as follows:

	1920	1921
Demonstrations on Reclamation Projects....	$48,600	$30,000

APPROPRIATIONS, BUREAU OF PLANT INDUSTRY.

The lump sum appropriation is divided into approximately forty subappropriations which specifically authorize and limit the character of work to be done with the funds provided therein.

Subappropriations:	1920	1921
Statutory salaries	$491,280	$517,300
General Expenses:		
Pathological laboratory, including Plant Disease Survey	62,020	62,020
Fruit disease investigations	72,935	72,935
Pecan diseases	8,000	8,000
Citrus canker eradication	196,320	109,720
Forest pathology investigations	82,315	81,115
Blister rust control	220,728	214,168
Cotton and truck disease investigations	87,800	95,400
Crop physiology investigations	48,460	46,860
Soil bacteriology and plant nutrition investigations	39,060	39,060
Soil fertility investigations	35,060	45,060
Crop acclimatization, including cotton, corn and fiber crops	93,910	93,910
Cotton seed interbreeding	7,500	7,500
New Zealand flax	3,000	.....
Drug & other plants, including physiology & fermentation	58,820	39,820
Crop technology, including nematode investigations	24,940	24,940
Biophysical investigations	32,500	.....
Seed testing laboratories, and Import Seed Law	36,680	41,680
Cereal investigations, including grain sorghums and flax	137,505	110,505
Corn improvement	40,000	32,000
Black and stripe rust	100,000	50,000
Barberry eradication	150,000	147,200
Corn root and stalk diseases	25,000	20,000
Cereal disease control	50,000	50,000
Tobacco investigations	32,000	32,000
Alkali and drought resistant crop investigations	24,280	20,080
Sugar plant investigations, including sugar plant diseases	71,615	71,615
Improving sugar beet seed production	10,000	10,000
Cane and sorghum sirup investigations	12,500	12,500
Economic and systematic botany	22,200	22,200
Dry-land agriculture	159,000	159,000
Western irrigation agriculture	73,580	52,380
Nut culture	20,000	20,000
Pomology	63,200	63,200
Grape culture	20,000	20,000
Experimental gardens and grounds	11,690	11,690
Horticulture	73,340	71,940
Nursery investigations (New 1921)	.....	20,000
Arlington Farm	21,900	20,500
Foreign seed and plant introduction	82,700	92,700
Erection of buildings & establishment of inspection stations	40,000	.....
Purchase of land, etc	10,000	.....
New and rare field seed distribution	57,800	56,600
Forage crops	81,980	73,400
Administrative and miscellaneous	29,040	25,980
Purchase & distribution of valuable seeds (Congressional Seed Distribution)	359,980	239,416
Total for Bureau, including statutory	$3,379,638	$3,004,394
Demonstrations on reclamation projects	48,600	30,000

While the field of the Bureau of Plant Industry is very broad, coinciding practically with that of crop production, it is obvious that the Bureau is not attempting to occupy that entire field. Any effort to do this would result in unnecessary and wasteful duplication of much work done by the state experiment stations and other state activities, such as the state departments of agriculture. In general it may be said that the work of the Bureau is concentrated on problems of national or regional character and on highly technical plant problems with which the state activities are usually less well equipped to deal. A large proportion of the regional and technical work is done in cooperation with the state experiment stations, although certain features of the Bureau's work require the establishment and maintenance of special field stations in the states under its own direction and control.

The equipment of the Bureau for the prosecution of its work consists of its laboratories, field stations and most important of all, its splendid corps of faithful and efficient men and women trained for and experienced in the numerous special phases of work which Congress has authorized to be done. This force is divided into somewhat flexible groups of workers based chiefly on the character of the problems to be solved or the service to be rendered. The general nature of the work of these groups and the names and titles of the specialists in administrative charge of them are shown in the following list;

ORGANIZATION OF BUREAU OF PLANT INDUSTRY.

Chief of Bureau.....Wm. A. Taylor,
Associate Chief of Bureau.....K. F. Kellerman,
Assistant to Chief of Bureau.....James E. Jones,
Officer in Charge of Publications.....J. E. Rockwell,
Officer in Charge of Records.....W. P. Cox
Laboratory of Plant Pathology.....Erwin F. Smith, Pathologist in Charge,
Pathological Collections.....Flora W. Patterson, Mycologist in Charge
Fruit-Disease Investigations.....M. B. Waite, Pathologist in Charge,
Investigations in Forest Pathology.....Haven Metcalf, Pathologist in Charge,
Citrus-Canker Eradication.....Directed by K.F. Kellerman, Associate Chief of Bureau,
Blister-Rust Control.....S. B. Detwiler, Forest Pathologist in Charge,
Cotton, Truck, and Forage Crop Disease Investigations.....W. A. Orton, Pathologist in Charge,
Crop Physiology and Breeding Investigations.....W. T. Swingle, Physiologist in Charge.

Soil Bacteriology and Plant-Nutrition Investigations.....Directed by K. F. Kellerman, Associate Chief of Bureau.

Soil-Fertility Investigations.....Oswald Schreiner, Biochemist in Charge,

Acclimatization and Adaptation of Crop Plants; Cotton Breeding.....O. F. Cook, Bionomist in Charge,

Fiber-Plant Investigations.....L. H. Dewey, Botanist in Charge,

Drug-Plant and Poisonous-Plant Investigations.....W. W. Stockberger, Physiologist in Charge,

Physiological and Fermentation investigations.....R. H. True, Physiologist in Charge,

Agricultural Technology.....N. A. Cobb, Technologist in Charge,

Biophysical Investigations.....G. F. Collins, Botanist in Charge.

Seed-Testing Laboratories; Enforcement of Seed-Importation Act.....E. Brown, Botanist in Charge,

Cereal Investigations.....C. R. Ball, Cerealist in Charge,

Tobacco Investigations.....W. W. Garner, Physiologist in Charge,

Alkali and Drought Resistant Plant Investigations.....T. H. Kearney, Physiologist in Charge,

Sugar-Plant Investigations.....C. O. Townsend, Pathologist in Charge,

Economic and Systematic Botany.....Frederick V. Coville, Botanist in Charge,

Dry-Land Agriculture Investigations.....E. C. Chilcott, Agriculturist in Charge,

Western Irrigation Agriculture.....C. S. Scofield, Agriculturist in Charge,

Horticultural and Pomological Investigations.....L. C. Corbett, Horticulturist and Pomologist in Charge,

Arlington Experimental Farm.....E. C. Butterfield, Assistant Horticulturist in Charge,

Gardens and Grounds.....E. M. Byrnes, Assistant in Charge,

Foreign Seed and Plant Introduction.....David Fairchild, Agricultural Explorer in Charge,

Forage-Crop Investigations.....C. V. Piper, Agrostologist in Charge,

Congressional Seed Distribution.....R. A. Oakley, Agronomist in Charge,

Demonstrations on Reclamation Projects..A. C. Cooley, Agriculturist in Charge.

Brief statements explaining recent work in some of our more important projects have been prepared especially for the use of those attending this conference, and copies of any or all of these brief statements will be available in the offices of the Bureau of Plant Industry.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS
Thomas H. MacDonald, Chief

June, 1920.

The Bureau of Public Roads, which in the past has been designated by various other names none of which fully described the bureau, comprises four principal divisions -- Highway Engineering, Drainage Investigations, Irrigation Investigations and Rural Engineering. Highway Engineering is further divided into the Federal Aid operations, which alone constitute one of the largest systematic plans for public works ever undertaken in the history of mankind, test and research in highway engineering and materials, and extension activities under the regular appropriations of the Department of Agriculture. These latter activities were at one time the largest of the Bureau and did much to develop the field of Highway Engineering in this country during the years 1896 - 1916.

The effective administration of the Federal Aid Act, compares in cost involved, in amount of work done and in personnel employed with the building of the Panama Canal. Its organization now comprises 13 separate districts, covering the entire United States. Each district includes from 1 to 8 states and the work of all is closely coordinated, applications being handled, the technical plans, specifications and construction estimates reviewed, and passed upon by the engineers with very little delay.

In spite of the apparent duplication required by the law and the so called "red tape", the Federal Aid procedure has, in fact, operated to protect the tax payer in getting value received. Had it not been for the authority specifically granted in the Act, those responsible for the administration of the law would many times have felt the lack of adequate support in taking the stand that they have had to take toward the states in many cases. Eleven states had no Highway Departments at all, several of them had departments with very little authority and were unprepared both technically and administratively to handle the state end of Federal Aid cooperation. Therefore, the Bureau has had to deal in many cases with departments which are practically new and consequently inexperienced.

Over 50 per cent of all applications for Federal Aid are handled in the district offices in an average of five days; 90 per cent of them pass the Chief Engineer's office in Washington to final approval in four days. The plans, specifications and estimates which the states furnish and which have to be reviewed, sometimes checked, and always reported on in detail with specific recommendations, pass the district engineer's office at about the same rate as the applications and 90 per cent of

them pass the District Engineer's office in three and a half days. There are at present over 3,000 active Federal Aid projects in the United States.

The Federal Aid Act is administered with 3 per cent of the appropriations and this fund is carefully controlled each month on the basis of actual performance under the Law. As an illustration of efficient administration, District No. 8, with offices located in Montgomery, Alabama, cost the Government $78,547 from December, 1916 to April, 1920, inclusive. This is an average of $1916 per month. Reports from the district engineer for that district show that the Bureau's engineering review and technical advice in connection with state projects submitted have resulted in large savings in road construction. A single case in one state was revised by the district engineer's office at a saving of $13,638.26. Another project was redesigned to cost $10,000 less at the time the plans were reviewed by the Bureau.

Extent of Highway Building.

In addition to $19,000,000 for Forest Road Construction the Congress has made available to July 1, 1920 the sum of $275,000,000. Of this sum $175,000,000 was available up to and including June 30, 1920. Of this amount the states had made application covering $152,193,040 as of April 30. This Federal Aid is to apply on 27,796 miles of road estimated to cost $355,754,799. As of May 1st 13,540 miles of Federal Aid road were under construction, involving over $86,000,000 in Federal Aid. The total mileage of completed road built under the Federal Aid law since it became operative in 1916 is 4,301.15 miles as of May 1, 1920, an average rate of construction of over 1000 miles a year.

The difficulties of transportation, the lack of materials, the insufficient number of contracting organizations, the scarcity of adequate equipment and the general shortage of engineering personnel in connection with highway construction during the past two years have reduced road building activities to about 3/7 of the full program. The Bureau is ready, the states are ready, the fund are available to push highway construction on a 100 per cent program just as soon as the national economic conditions will warrant.

Notable Achievements.

The Bureau discovered, developed and taught the construction of sand-clay roads. This type of road was the salvation of the southern states and marked the first impulse toward rural development in that region. The public roads of those states had, with few exceptions, never been improved until the possibilities of sand-clay construction became known. The reports of this Bureau during the years

1900 to 1912 show that hundreds of thousands of square yards of sand-clay were built under the direct supervision of its engineers, sent out to assist the local county and district road authorities.

Every other type of road construction adaptable to rural condition was carefully studied and the simplest and best methods of constructing the types were taught to the local road builders of counties all over the United States.

Because road construction involves the use of such large quantities of materials as the highway program expanded it became apparent that the value of public investment in such work depended to a very great degree on the durability and strength of the materials used. This led to the development of the testing and research work which many believe has resulted in more detailed, technical knowledge of value to Highway Engineers than the work of any other organization in the world except possibly the work of the Eccle de Ponts et Chaussees of France. The Director and Engineers of the office developed testing apparatus which is recognized as standard. All such ideas were, of course, given to the world without patent restrictions.

After the machinery was developed investigations were carried on to determine the relative value and durability of rocks used for road building in many parts of the United States. The products of thousands of quarries have, in the course of our activities, been tested and the results of the tests in most cases have been furnished local road authorities whose responsibility for making purchases has been much more intelligently exercised. Consequently local road funds have been more productive of durable roads. In highway construction throughout the United States the Bureau of Public Roads has furnished a large part of the information on which the intelligent expenditure of road funds has been based.

Work of Testing Division.

It is believed that the Bureau of Public Roads, through its Testing Division has done more than any other single agency in developing the intelligent use of bitumens in road construction. Experiments conducted under service conditions by this Bureau decided whether a soft stone could be used in bituminous macadam and bituminous concrete; whether rocks having a marked clevage could be used to advantage in such construction; what quantities of bitumen give the best results when used as surface treatments on water-bound macadam and what kind of covering material and what quantities should be used in any case.

A large amount of detailed technical information valuable to highway engineers generally was secured by the Bureau in the course of its research and experimental work. The ability of the highway engineer to construct roads which would accommodate automobile traffic has, in no small degree, been the under-lying reason that the automobile industry has developed to its present enormous proportions.

In 1916 the passage of the Federal Aid Road Act marked a new epoch in highway construction in the United States. The war then in progress emphasized the need of further developments in road building. The Bureau has sought to keep well to the front in the solution of the new problems presented. It is today conducting experiments and investigations of a fundamental character.

Drainage Investigations.

The Drainage Investigations consist of two principal lines of work: Surveys and designs of drainage districts, and farm drainage systems.

In the farm drainage work the Bureau accurately locates the pipe lines and adjusts their general lay-out so that minimum quantities of excavation and pipe are required. Practically no farmer can do this work for himself because it involves methods with which he is unfamiliar.

Surveys for this work insure that the systems will drain, if constructed according to plan. This work has been done in every state east of the 100th meridian. Its effect is direct in increasing the productiveness of agricultural land.

The surveys made by Drainage Investigations for the reclamation of larger tracts requiring drainage are of less direct importance to the operating farmer but just as important to the country as a whole. The Bureau has made expert examinations of 28,702 square miles of swamp, wet and over-flowed land which is subject to reclamation by drainage. It has made surveys and completed tentative plans and in some cases complete plans for the reclamation of 11,494 square miles. In the eastern and southern states this work is comparable with the work of the Reclamation Service of the Department of Interior for the arid lands of the West. The subject of land drainage for agricultural and reclamation purposes has not been a commercial undertaking on a large scale. Two of the largest engineering companies in the country handling drainage work are headed by former employees of the Bureau. Several other companies are composed of men formerly employed by the Bureau and no less than six professors of hydraulic or irrigation engineering have been recruited from its forces. The Chief Engineer and the Consulting Hydraulic Engineer of the largest single flood control project in the country were formerly with the Bureau.

In addition to the cooperative work with farmers Drainage Investigations has carried on valuable research work relating to the depth and spacing of tile drains in different kinds of soil. This study has been of benefit to farmers and has resulted in more uniformily. successful, and at the same time economical, tile drainage.

Run-off studies in tile drains and ditches and the flow of water through drain tiles have constituted other research subjects of vital interest to drainage engineers in the production of surveys and designs for economic land drainage.

Irrigation Investigations.

The Division of Irrigation Investigations operates principally west of the 100th meridian in the arid regions. Its work is complementary to that of Drainage Investigations. It is of peculiar value because new settlers are often from sections of the country where irrigation is not practiced. The information assembled and placed in the hands of farmers includes water-duty studies covering all crops, the handling of water on the field, the measurement of water so that the farmer may protect himself, the use of various systems of field distribution and the effects of different irrigating periods.

Irrigation farming requires a wide range of information and great intelligence because of the appliances used and the different methods employed. The results of unintelligent irrigation farming are only too apparent in water-logging, alkali flooding, seepage and land ruined through the use of too much water. The Irrigation Division investigates every new problem that practical conditions present and carries on independent research to assist the irrigation farmer.

Just as the County Agents go on the farms and suggest and teach, so our drainage and irrigation engineers go on the land and instruct and advise in matters pertaining to their lines.

From the personnel of our Irrigation Division the Bureau has supplied the professional and commercial world with the following: Head of the Department of Agriculture of the Canadian Pacific Railroad, Chairman of the Land Settlement Board of California, Chief Engineer of the United West Indies Corporation, Haiti, Engineer of the Association of Concrete Pipe Manufacturers, and Engineer Appraiser for the Federal Farm Loan Board.

Rural Engineering.

> The Rural Engineering Division is especially concerned with making life on the farm even more worth living. The development of domestic water supply, sewage disposal, electric light plants and power, gas engines and mechanical equipment for the farm constitutes a large field of possibility. The Rural Engineering Division handles problems of this nature and all mechanical problems relating to the farm.

Its architectural section cannot begin to supply the demand for reproductions of its plans for farm houses and buildings, each of which represents a special study. This division cooperates with the Bureau of Plant Industry and other branches of the Department in designing store houses, tool houses, barns and animal buildings for the farm and every effort is made to keep closely in touch with actual conditions of farm life with a view to making the work on the farm less onerous, the life more attractive and the business of farming on a commercial scale more lucrative.

Work of Former Staff Members.

In addition to men referred to above the Bureau has furnished state highway engineers for five states, assistant state highway engineers to two. In the organization are five men formerly at the head of State Highway Departments. The Bureau has furnished testing engineers to three states; professors of highway engineering to two. It has trained and furnished county engineers to organizations conducting large road programs in seven counties paying

their engineer as high as $7,500 per annum. It has furnished a Chief Engineer, two Chemical Engineers and a general Secretary to three of the largest supply and material concerns in the United States; and a general manager to one of the largest industrial testing organizations in the country.

UNITED STATES DEPARTMENT OF AGRICULTURE

February 1, 1921.

DIVISION OF PUBLICATIONS

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John L.Cobbs, Jr.,Chief.

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This division conducts the publication work of the department; all business of the department transacted with the Government Printing Office, has general supervision of all printing, indexing, illustration, binding, and distribution of publications, and the maintenance of mailing lists. The Press Service, the Office of Exhibits, the Office of Illustrations, and the Motion Picture Activities are also a part of this division.

Editorial and Printing Section.

The Editorial and Printing Section is organized to edit manuscripts, read proof, make indexes, draw requisitions upon the Public Printer, and inspect the finished product. This section carries the department's publications and job printing through the press.

The department's two leading series of publications are Department Bulletins and Farmers' Bulletins. Broadly speaking, the Department Bulletins announce the results of the department's investigations. Some of them present the facts in a strictly technical manner, and these are designated as Professional Papers. Others are more popular in form, but are intended to give with scientific accuracy the new facts ascertained by the department's workers. The Department Bulletins contain much fundamental scientific data.

Farmers' Bulletins, on the other hand, do not necessarily contain new facts. They are intended to instruct, to explain, to guide the reader in putting the best agricultural knowledge into use. The information they contain may be as old as the hills, but it is also the latest; it is up-to-date and practical; it is prepared so that the farmer can use it.

The standard original edition of a new Farmers' Bulletin is 50,000 copies. Those that prove their value are reprinted according to demand, until the information they contain is superseded by new facts. Then they may be revised or rewritten.

The aim of the Farmers' Bulletin series is to furnish the farmer an agricultural primer on practically every subject connected with his work. More than 1,100 have been issued, and about 500 are on the active list, available for distribution. They are sent out chiefly upon orders from Members of Congress, each of whom this year has had to his credit an

allotment of 20,000 copies. In the fiscal year 1920, 11,461,000 copies of Farmers' Bulletins were issued, of which 7,233,347 were distributed by Members of Congress.

Much improvement has been made in the Farmers' Bulletins in recent years, particularly in their appearance. Free use of half-tone illustrations from good photographs is the rule. At present the covers are receiving special attention. Composite photo-drawings have been used very successfully for "all-over" cover designs, and some of the bulletins have been made very attractive by their use.

The Department Circulars form a series intermediate between the Department Bulletins and the Farmers' Bulletins.

The Department of Agriculture issues also a number of periodicals, such as the Weekly News Letter, Monthly Crop Reporter, Market Reporter, Journal of Agricultural Research, Experiment Station Record, Public Roads, and Monthly Weather Review, each of which has its special field.

Five or six of the Bureaus and Boards of the Department issues Service and Regulatory Announcements, giving announcements, rulings, and decisions relating to the enforcement of certain regulatory laws affecting the public--for instance, the Meat Inspection Act and the Food and Drugs Act.

The Yearbook is probably the best known single publication of the department. This contains articles adapted to "interest and instruct the farmers of the country" and a compendium of agricultural statistics of the highest authority. It is distributed chiefly by Congress.

A number of less formal publications, such as posters, placards, and leaflets, are issued by the department, many of these being prepared in the Press Service of the Division of Publications.

Press Service.

The Press Service is, first of all, a service bureau to the press. It is the point of contact between the Department of Agriculture and agricultural and trade journals, newspapers, magazines, the press associations, Washington correspondents and other writers. All informational publicity from the various bureaus clears through the Press Service. A number of regular informational services to the press are issued, but the office also helps outside writers to develop stories about the department's work; it searches the department for photographs, maps and charts to meet particular needs; and it obtains on request from editors special articles from the department's investigators and scientists, so far as facilities permit the writing of them.

The regular informational services of the department are as follows:

Weekly News Letter. This journal, the official publication of the department, serves a two-fold purpose. It is a news service in that it carries official statements by the Secretary and by the various bureaus of the department, and stories reporting the progress and results of department investigations. It is a house organ for the department's large staff of employees and official cooperators. It strives to keep them informed of new work begun, the progress of various campaigns, and to present ideas that will help them in their work. It is our purpose to print in the Weekly News Letter only such matter as is of wide interest, and while we try to prepare most of the items in a form suitable for publication, it is realized that the chief value to editors of certain articles is to present the department's views on various subjects and to provide information for such use as the editor sees fit to make of it.

The Weekly News Letter is sent free only to employees, official cooperators, and the press. It can be obtained, however, from the Superintendent of Documents, Government Printing Office, at the subscription rate of 50 cents a year. Its total circulation is 127,100.

Special Information Service. This is an illustrated weekly syndicate of eight columns for daily newspapers. It is issued as a proof sheet several days in advance of its release, and it is made up of four departments of two columns each, as follows: "Growing Food-on the Farm; In the Yard;" "The Business Side of Farming;" "A Bird in the Hand" (Poultry); and "Housekeeping and Homemaking." Cuts, mats, and photographic prints of the illustrations were lent for the use of newspapers until a year ago, when reduced funds made it necessary to discontinue the cut and mat service. The mat service has recently been restored and both photographic prints and mats of the illustrations are available now. This service is sent to 3,376 daily and weekly newspapers that have asked to receive it.

Although the Press Service has recognized the primary obligation of serving the agricultural press, it has realized more and more in recent

years the need for developing information services that would carry the department's message to city people. It was this realization that brought about the establishment of the Special Information Service and it has met a popular demand for stories on how to produce food in back yards and how to preserve food and use it most economically in the home. While it was started during the war as a news service for city readers, it has been developed into a service both for country and city readers. Telling the story of food production both on the farm and in back yards, marketing problems as they relate to the consumer as well as the producer, and household economy on the farm as well as in town, has broadened its field of usefulness and has enabled it to serve another purpose--to interest and inform city people about agricultural problems, thereby inspiring a greater respect for food and an understanding of its production and distribution. While it is a newspaper service, it is sent also to agricultural journals that ask for it.

Food and Farming Weekly. This is a press clipping sheet released every Monday. It carries eight to twelve or more short stories of results and progress of the department's work. It is a running account week by week of what the Department of Agriculture is doing. This service attempts to meet the requirements of editors for brevity, telling its stories in the fewest works possible. It is sent to 5,017 publications of all classes that have requested it.

Plate Service. One of the ways in which the Service makes contact with the weekly and small daily newspapers in the country is through the plate and readyprint service of the Western Newspaper Union. Twenty to 25 columns of matter with illustrations are furnished to this concern weekly. In addition to this specially prepared material, proofs and illustrations of the Special Information Service are furnished and this matter also is distributed in plate and readyprint. The plate service enables the department to reach with its informational material millions of readers of small newspapers which are unable to set the type in their own offices. More than 150,000 columns of agricultural material, practically all of it furnished by this department, is distributed in plate and readyprint by the Western Newspaper Union annually. The department's part in this form of distribution is only in furnishing the material. The

plate and readyprint matter is sold at a nominal price.

Mimeograph service. News matter requiring immediate distribution is issued in mimeograph and sent generally or locally, according to its applicability and interest. By this means the office supplies its "spot" news to press associations, Washington correspondents, agricultural journals, trade journals, and newspapers.

Special Articles. The department is glad to furnish on request special articles by its writers or specialists. Obviously it can not offer an unlimited service in this respect, because men in scientific and investigational work who are called upon for articles frequently are in the field or are engaged upon other duties requiring their full time for the moment. To meet the demand for special stories and to enable the department to present more thoroughly and completely the results of its more important lines of work, the Press Service has developed a special-story service to noncompeting agricultural journals. For this purpose, noncompeting lists have been made up from correspondence with editors.

The noncompeting lists also have been used in distributing photographic layouts and cartoons. Through a similar distribution the office prepares special articles for syndicating among Sunday newspapers.

Other activities. Other activities of the Press Service include the preparation of posters and circulars for use in support of the various educational campaigns carried on by the department. The use of the poster in agricultural education unquestionably has been carried further by this department than by any other agency. As a result of the department's work in this field, State institutions and other organizations have followed up the idea until the poster is now a recognized medium for disseminating agricultural information in print. In the last two years the office has made effective use of more than 30 posters, portraying the various activities of the department.

The Press Service has shown the value of conducting publicity campaigns in the field. It was found that local or regional campaigns in which the department was interested in many cases required local or regional publicity. The office sent its representatives to the field

to meet editors personally and sell them an idea, and to gather first-hand information -- local interest stories and stories of individual experience having ideas worth telling elsewhere. The tick-eradication campaign in the South has been greatly aided by field work of this sort. Last year a representative of the Service made two trips over the cotton States to assist the press in putting before farmers information concerning the newly perfected system of combating the cotton boll weevil by the use of calcium arsenate. Two representatives of the Service made special trips to interest the press in the use of the Eastern National Forests for recreational purposes. In a campaign to encourage membership in farm bureaus conducted two years ago, the Service sent three representatives in the field to gather informational material for magazine and newspaper stories. The Service also has covered numerous conferences in various parts of the country.

The Service is placing an increasing amount of material in the magazines. In recent months special articles prepared by the writers in this office have been accepted by such magazines as The Saturday Evening Post, Collier's, The Outlook, The Ladies' Home Journal, Pictorial Review, The Delineator, Scientific American, Popular Science Monthly, Popular Mechanics, Literary Digest, and Leslie's. We are endeavoring to work this field not only in preparing articles ourselves, but by selling ideas for stories to editors and inducing them to assign their writers to the subjects. As our force of writers is small, and the time which they have for preparing magazine articles is limited we are making greater use of the alternative method of inducing editors to have articles written by staff writers with our assistance.

Distribution of press material. Every effort is made to give the widest possible distribution to our press material so as to place it only where it will be of interest and to avoid waste. With the regular informational services, the policy has been adopted of sending them only to publications that request them. The only exception to this is the Weekly News Letter, which is sent to nearly all publications. We have, however, queried the daily newspapers and are sending the News Letter only to some 800 that ordered it. Effort is made through form letters to induce editors to ask for these services, but no publication is listed without

the specific request. The mailing lists of the office have been so refined and specialized that it is possible to make distribution of material locally or generally or to publications even in different classes which have a common interest in a subject. To place a story strictly within the region of its applicability is sometimes extremely difficult, and in such cases editors are given the benefit of the doubt, our thought being that it is better to include them in the distribution of a story than to miss them altogether, especially since editors many times are likely to be interested in the problems of their neighbors.

Motion Picture Activities.

Motion pictures have proved their effectiveness in making common property of knowledge developed by investigations of the United States Department of Agriculture, and in acquainting the public with the methods and significance of important lines of work being carried on by the department. Many field workers of the department and the cooperating State agricultural colleges and other institutions are using the department's films with increasing frequency.

The motion picture films of the United States Department of Agriculture now include 122 subjects. The number of reels available for distribution is 550, or more than 550,000 feet of film. All of this film is in circulation, most of it constantly. Reports made by users indicate that in the past twelve months more than 1,500,000 persons witnessed showings of one or more department films. Thus the motion picture -- yet in its infancy, but already responsible for one of the most important industries in the United States - is being used for better farming.

State Distributing Centers Needed.

One of the greatest present needs of the motion picture work is the establishment of State film libraries and distribution systems for agricultural motion pictures. The United States Department of Agriculture pictures, it is believed, would serve well as a nucleus for such libraries at the State agricultural colleges. Plans looking toward the establishment of such libraries are being formulated.

Many Uses for Films.

Here are instances of ways in which Department of Agriculture motion pictures are being used:

A county agent projects the film, "Construction of a Wooden Hoop Silo," before a farm bureau meeting, and thus he shows in fifteen minutes what would require a full day to demonstrate.

A home demonstration agent projects, "The Home Demonstration Agent," and rouses a rural community to the benefit that will come from organized women's work.

A Bureau of Animal Industry inspector overcomes opposition to cattle-tick eradication by showing, "The Charge of the Tick Brigade," and supplementing that film by "Making the South Tick Free;" and enlists effective cooperation in hog-cholera eradication by use of the film, "Control of Hog Cholera."

Forest Service men use several films in safeguarding the woodlands from fire; and demonstrate visually the evils of bad lumbering and the benefits of good lumbering.

Agricultural colleges and high schools exhibit "Grazing Industry on the National Forests" or "Selecting a Laying Hen," giving their students ideas that could not otherwise be obtained except at the expenditure of much time and money.

Chambers of commerce and other local commercial organizations are shown "Cotton's Worst Enemy --- the Pink Bollworm," and thus are caused to enlist in the campaign against this dangerous insect.

Churches project "Embryology of the Egg," and give their children and older people as well an accurate idea of how life begins.

Dairy organizations obtain the use of "Why Eat Cottage Cheese" and through it establish new consumers of a skim-milk product that formerly was wasted.

"Home Gardening" is used in community campaigns to make back yards and waste places produce food.

These are only a few instances of what may be done --- and has been done --- with motion pictures, the comparatively new adjunct in agricultural extension and field work. The instances may be multiplied to a number and variety governed only by local needs and conditions and by the enterprise of the field workers.

How Films Are Distributed.

The films produced by the United States Department of Agriculture are intended primarily for the use of extension and field workers of the department and of officially cooperating institutions. The number of copies of these films which the department is able to supply is at present inadequate to meet demands from other sources. However, others desiring to borrow films may make application through their county agent,

or other department field worker, the director of extension of their State agricultural college, or other officially cooperating agency, and the films can be furnished if not in use.

Films are furnished free of charge except for transportation, which the borrower is required to pay.

Film Circuits Desirable.

The Department of Agriculture has found that the showing of films on circuits makes it possible to get the maximum service from the pictures. It therefore favors the organization of circuits over which its films may be distributed. In such circuits county agents, home-demonstration agents, club leaders, bureau field men, or any other class of department or State extension workers may be organized and films may be routed from one to the other. It is essential in such cases for some responsible person to act as the agent for the entire circuit. Arrangements should be made with the department by this person. The films will be sent to him and he will be expected to return them in good condition to the department.

The circuit plan is subject to many variations and much development. The aim of this department is to obtain distribution for its films and only a few essential requirements are insisted upon. The department is glad to cooperate with any State agricultural college or other institution in arranging such circuits and in preparing programs of films that may be routed in this manner.

How to Purchase Department Films.

Because of the insistant demand for copies of its films, the department has made arrangements with a commercial film manufacturer whereby prints of department films may be purchased at the cost of manufacture -- which on standard inflammable stock is about 4 cents a foot or about $40 a thousand-foot reel, and 6 cents a foot or $60 a reel on narrow-width,slow-burning or "safety" stock -- by individuals or organizations authorized by the department to make such purchases.

This arrangement has given State agricultural colleges, public school systems, farmers' organizations, boards of trade, organizations of many sorts, an opportunity to establish or add to their film libraries. The only requirements are that the subject matter of the film shall not be

changed and that credit to the department shall be retained. When prospective purchasers desire to view department pictures arrangements will be made for projection in the laboratory in Washington, or when possible, the films will be shipped for projection elsewhere.

How Films Can Be Exhibited.

Use of films depends upon the availability of a projector, which in turn depends upon whether or not electric current can be obtained. Electric current is essential because no other light furnishes the strong illumination required for satisfactory results on the screen. However, it is possible to use small generating plants in localities where no current is manufactured commercially.

The extension worker or other person desiring to purchase a projector will be governed by his needs, as well as by the money he can spend. If he wants to cover a wide territory and give frequent exhibitions in different places, he will need a portable machine. If he wishes to give less frequent showings, with more preparation and possibly better projection, he may find a semiportable satisfactory.

Hundreds of county agents now are equipped with portable projectors. In most cases the funds have been furnished by the county farm bureau or other farmers' organizations. Other extension workers are making use of projection machines in school buildings, theaters, lodge halls, and other places so equipped. Some of the extension workers using portable machines have their automobiles geared to a generator that furnishes the necessary current for the projector light and for the operation of the projector. Still others have a complete lighting equipment that they can transport from place to place.

A novel and effective way of using motion pictures in localities where they have never been shown before is in use in several States. A motor truck or trailer is equipped with a projector, reels of film, and a screen. Reaching a rural community, the screen is unpacked and hung up on the wall of a building. The motor truck is placed in such position that the projector will throw upon the screen. The engine of the truck is started generating electric current, and at the appointed hour the "show" begins. In inclement weather the projector may be taken from the truck and set up inside a schoolhouse or other building.

The department on request will furnish further information on these methods of showing motion pictures.

The Section of Illustrations.

The Section of Illustrations is subdivided into drafting and photographic units. Its work is primarily intended to illustrate the department's publications.

The drafting unit prepares charts, maps, diagrams, mechanical drawings and free-hand drawings, and retouch photographs, designs cover-pages of Farmers' Bulletins, and posters for educational campaigns, engrosses letters of introduction for those of the department who visit foreign countries and arranges and determines the size of pictures to appear in the publications.

The photographic unit of the section produces laboratory negatives covering a multitude of subjects. When the object to be photographed can not be brought to the laboratory the various bureaus have shown a growing tendency to avail themselves of the services of the expert photographers of this section to secure technically correct negatives of their field work; the expenses incidental to field trips being paid by the bureau interested. Negatives taken by the scientific staff in the field are shipped to this laboratory for developing and printing.

The production of lantern slides is a growing feature of this section's work, 20,000 slides having been made during the past year. These slides are used in lectures delivered by the scientific staff and are also made for the library of visual instruction of the States Relations Service, which releases them to educational institutions, churches, and county agents throughout the country.

For the Office of Exhibits prints, lantern slides, bromide enlargements and transparencies are made and colored, to form part of the exhibits of the department at the various fairs and expositions, as described elsewhere.

The Section of Illustrations has also in its custody approximately 25,000 original cuts from which are printed the illustrations of the department's publications. A large number of requests are received each year from publishers and State institutions for illustrative material. Photographs released for publication are furnished to the applicant at cost and duplicate electrotypes from our original cuts may be had at the usual commercial rate for such work.

Office of Exhibits.

This office was designed to centralize and coordinate the exhibit work of the Department of Agriculture so as to present most effectively at fairs, expositions, etc., the information developed by the department. It has been in existence for about fifteen years, but previous to 1917 the department participated in only a limited number of fairs and expositions, usually under an appropriation directing it.

Shortly after the outbreak of the war in 1917, the Secretary of Agriculture authorized the expenditure of approximately $25,000 directing the Office of Exhibits to cooperate with the various bureaus of the department and the Federal Food

Administration in making exhibits and demonstrations in food conservation, preservation and distribution. The department made about twenty exhibits and demonstrations in cooperation with the Food Administration and the State colleges of agriculture. This work, with an appropriation of about $40,000, was continued during the fiscal year 1918 at approximately thirty-five fairs and expositions.

The appropriation for the Department of Agriculture for the fiscal year 1919 included an item of $100,000 to enable the department to make suitable agricultural exhibitions at State, interstate or international fairs and expositions in the United States. The Office of Exhibits arranged for the collection and display of about six carloads of suitable agricultural exhibits at nearly sixty fairs and expositions, including practically every State fair in the United States, every national or international exposition, and made an especially large and attractive exhibit and demonstration at the National Dairy Show, the International Live Stock Show, and numerous national and international poultry and pet-stock exhibitions.

During the current year the office has been working under an appropriation of only $70,000 but couched in similar terms to that of the previous year. It arranged the display of exhibits at about seventy of the larger fairs and expositions in the country, sending out six carloads of material to fairs arranged on six circuits, and in case of some of the larger national shows like the National Dairy Show in Chicago, and the Grain and Hay Show held in conjunction with the International Live Stock Exposition, special material was prepared and sent direct. Each circuit car was in charge of four men who accompanied the exhibits to each circuit fair and assisted in installing and demonstrating the exhibit. The attendance at these fairs was in the neighborhood of 9,000,000 people.

The office is under the embarrassment of being unable, under its appropriation, to incur expense for exhibiting at fairs which do not come within the description in the appropriation; that is, State, interstate or international fairs or expositions, and for this reason finds it impossible to accede to requests for exhibits at smaller fairs. Occasionally it is enabled to send material, however, under an arrangement by which the organization requesting agrees to pay expenses.

Distribution Section.

The Distribution Section is the avenue through which the great fund of information gathered by the many activities of the department flows to the public. Its contact is fourfold.

First: Informing the public what the department has to "sell" by the issuance of the Monthly List of Publications, which is sent monthly to more than 200,000 people. The receipt of this pamphlet is an invitation to order such of the information as is desired.

Second: The contact with millions of people through Members of Congress, by reason of the fact that each of those officials has an allotment of Farmers' Bulletins for distribution. This office furnishes lists of the bulletins in stock, keeps a record of Congressional quotas and in other ways assists in the Congressional distribution.

Third: By personal contact with persons who call at the department. These total several thousand each year.

Fourth: By furnishing publications, request for which has been stimulated by the issuance of press bulletins.

Between 2,500 and 3,000 applications for information or publications are received daily by the Division. The mail when received is assorted into classes for convenience in handling. For instance, requests for Farmers' Bulletins only are placed in one group; Farmers' Bulletins and miscellaneous publications in another; obscure or indefinite requests in another, and so on.

Whenever it is possible completely to answer the request for information by sending a publication no other action is taken. Where this is not possible, an explanatory letter is written and the applicant is informed where to apply. Unfortunately the department's supply of publications is insufficient to meet the demands received for them and it is necessary to refer applicants to the Superintendent of Documents, Government Printing Office, who under the law is authorized to sell Government publications at a nominal price. During the last fiscal year more than 600,000 communications were received and handled in the Distribution Section.

This distribution work includes a record-keeping unit, where a card account of the distribution of each individual publication is kept and where it is possible to tell at a glance the condition of any publication carried in stock. As the distribution is made from the mailing room both in the department and at the Office of the Superintendent of Documents, daily stock reports are issued and the balances carried on the record cards brought to date.

The mailing-list record unit serves as a clearing house for all matters pertaining to mailing lists. Here the requests for additions, changes, and "drops" on various mailing lists are received and the general index of all addresses maintained. The addresses are arranged, typewritten, compared with the general index, and orders issued to the units having in charge the mechanical phase of mailing list work.

The aggregate number of addresses carried on the various mailing lists at present is more than 1,000,000. These mailing lists are constantly being revised. The largest list is that to which the Monthly List of Publications is sent. This list is maintained by the Division of Publications and forms

the basis for the great miscellaneous distribution. Anyone desiring may have his name listed to receive this pamphlet.

The bulk of the actual addressing and mailing in connection with the distribution work is done at the Office of the Superintendent of Documents, Government Printing Office. However, for convenience in supplying information required by the work of the department, and those who call in person at the department seeking information, a small supply of all the publications in stock is kept in this office.

The department cooperates with Members of Congress in their distribution of four-fifths of the Farmers' Bulletins. This Division handles a great deal of the correspondence requesting information contained in our publications, which are referred direct from Congressmen's offices. Probably the most salient feature of this cooperative work is supplying lists of Farmers' Bulletins, 6,841,000 of which were supplied last year. The usual practice of the Members is to print a letter on the back of the list and then forward it direct to constituents. The recipient scans the list and selects publications treating on the subjects in which he is interested. The lists are then returned to the Member, who forwards them to the department and the mailing of the publications is arranged for in the Office of the Superintendent of Documents, after a record of the number sent in response to each order is noted here. This method of distribution is believed to be a much better practice than simply broadcasting the publications throughout the country. It is the one most generally used at present by Members of Congress.

The Information Unit is maintained in this Division for the purpose of assisting visitors to secure the information desired. During the last year approximately 7,000 persons visited this office.

The total number of publications distributed for the year ending June 30, 1920, was 45,237,747. Of this number 25,274,618 were miscellaneous publications; that is, publications other than Farmers' Bulletins. Upon orders of Members of Congress, 7,233,347 of these bulletins were distributed and 5,340,750 by the department, making the entire number of Farmers' Bulletins distributed 13,122,129. Despite this large distribution, the department is unable to supply anything like the demand made for its publications. Under the present law but one-fifth of the number of Farmers' Bulletins is allotted to it for distribution, and at the end of the first six months of the present fiscal year this allotment has been practically exhausted, making it necessary to refer all requests of miscellaneous applicants to Members of Congress for attention.

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UNITED STATES DEPARTMENT OF AGRICULTURE

June, 1920.

STATES RELATIONS SERVICE.

A. C. True, Director.

The States Relations Service represents the Secretary of Agriculture in his relations with the State agricultural colleges and experiment stations, under the acts of Congress granting funds to these institutions for agricultural experiment stations and cooperative extension work in agriculture and home economics; in carrying out the provisions of acts of Congress making appropriations to the department for farmers' cooperative demonstration work, investigations relating to agricultural schools, farmers' institutes, and home economics, and the maintenance of agricultural experiment stations in Alaska, Hawaii, Porto Rico, Guam, and the Virgin Islands.

The service is divided into five main offices: (1) The Office of the Director, (2) Office of Experiment Stations, (3) Office of Extension Work in the South, (4) Office of Extension Work in the North and West, and (5) Office of Home Economics.

Office of the Director.

The Office of the Director handles all administrative matters relating to personnel, finances, and other executive business. It also includes the Editorial Division, and sections dealing with investigations on agricultural instruction in schools, and farmers' institutes and movable schools.

The section dealing with agricultural instruction in schools studies the methods and subject matter of school instruction in agriculture in this and other countries, furnishing schools with up-to-date and properly organized subject matter and illustrative material.

The section dealing with farmers' institutes and movable schools studies the methods used and prepares publications and illustrative material especially adapted to these purposes.

Office of Experiment Stations.

This office is broadly organized to exercise the supervision provided by law over the funds and operations of the State agricultural experiment stations under Federal appropriations, and to afford such advice and assistance as will best promote their efficiency.

This office also collects and disseminates, through the Experiment Station Record and otherwise, information regarding similar institutions and work throughout the world. To this office is assigned the general direction of the work of the insular experiment stations in Alaska, Hawaii, Porto Rico, Guam, and the Virgin Islands, which carry on investigations

and experiments with reference to native and introduced crops, plant and insect pests, and improvement of live stock, with a view to the diversification and general improvement of the agriculture of these outlying possessions of the United States.

Offices of Extension Work.

The two offices of extension work, one for the South and the other for the North and West, undertake, in cooperation with the State agricultural colleges and local organizations, to carry directly to the farm and the farm home the information regarding agriculture and home economics collected by the department and the State agricultural colleges and experiment stations.

At the present time the department cooperates with the State agricultural colleges in employing 3,800 extension agents, of whom 2,340 are engaged in county-agent work, 1,040 in home-demonstration work, and 410 in club work. Approximately 2,000 counties have men agents and 800 have women agents. Altogether there are over 2,800 counties that have sufficient agriculture to demand the employment of an agent, but only about two-thirds of these counties have men agents and not quite one-third have women agents. The ideal to be attained is to have a man and a woman agent in every agricultural county.

Appropriations: During the present year there is available $14,250,000 to carry on this work. Of this amount, $5,780,000 is provided by the Federal Government under the provisions of the Smith-Lever Act and the direct appropriation to the department for farmers' cooperative demonstration work and for demonstration work to be carried on by the investigating bureaus of the department. Of the $8,470,000 available from within the States, $4,640,000 was contributed through sources within the respective counties, the remainder being contributed by direct appropriation of the State legislatures or from funds under the control of the State colleges. Of this fund, $7,872,000 is being used to pay the salaries and expenses of agents employed in county-agent work, $3,560,000 for home-demonstration work, and over $1,000,000 for the employment of county club agents and leaders. At present it is difficult to maintain a sufficient force of suitably equipped extension agents, on account of high prices and the competition of outside agencies for the type of men and women that make successful extension agents.

Office of Home Economics.

The Office of Home Economics investigates, both from the scientific and from the practical standpoint, the nature and uses of

agricultural products utilized in the home for food, clothing, and equipment, and the methods of household work and management.

The publications of the Office of Home Economics make available to housekeepers, teachers, students, and extension workers the results of such studies. This office conducts investigations with the respiration calorimeter, an instrument that measures energy in terms of heat and the exchange of gases due to respiration. The investigations include studies of the efficiency of foods, clothing, and household equipment and various methods of work. This office is the only one in the Government service that devotes its time exclusively to investigating subjects of material interest to the home and to farm women.

Publication Work.

The publication work of the States Relations Service is handled through its Editorial Division, which also has charge of lantern slides and other illustrative material for service use, and the duplicating and publicity work of the service.

In all matters of printing and distributing publications and dissemination of publicity matter the service works through or in cooperation with the Division of Publications of the department. The States Relations Service makes an annual report to Congress on the work and expenditures of the agricultural experiment stations under the Hatch and Adams acts, and on cooperative extension work in agriculture and home economics under the Smith-Lever Act.

It publishes the Experiment Station Record, a technical review of the world's scientific literature pertaining to agriculture, the distribution of which is restricted to persons connected with the agricultural colleges, experiment stations, and similar institutions, and to libraries and exchanges. The Record is issued in two volumes of ten numbers each annually.

It publishes the results of the work of the experiment stations in Alaska, Hawaii, Porto Rico, and Guam in reports and bulletins.

It publishes the results of the work of the Office of Home Economics on food, clothing, shelter, and household management, in the form of technical bulletins and through the Farmers' Bulletins of the department.

It issues professional bulletins and leaflets based on the work of the Division of Agricultural Instruction in Schools.

It also prepares reports on studies of problems in agricultural

education, in cooperation with the Federal Board for Vocational Education and the Association of Land Grant Colleges which are published by the Board or the Association.

The cooperative extension work is aided by distribution of circulars, lantern slides, and other illustrative material, prepared by the service in cooperation with the other bureaus of the department and the State extension services.

The service makes contributions to the Farmers' Bulletin series of the department, especially on subjects in home economics; it prepares articles for outside publication in technical journals, and supplies a considerable amount of material relating to the more popular features of its work for the use of the Office of Information of the Division of Publications of the department.

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UNITED STATES DEPARTMENT OF AGRICULTURE

June, 1920.

BUREAU OF SOILS

Milton Whitney, Chief.

Chemical Investigations.

Statutory provision: For chemical investigations of soil types, soil composition, and soil minerals, the soil solution, solubility of soil and all chemical properties of soils in their relation to soil formation, soil texture, and soil productivity, including all routine chemical work in connection with the soil survey, appropriation, 1920, $23,110.

Under this general project the bureau has studied during the twenty years of its existence the chemical constituents of the soils of all parts of the country. It has investigated these constituents qualitatively and quantitatively, showing their relation to one another and to plants, their solubility and permenency, and the manner of their functioning. It has studied the problem of alkali--that condition arising where soils contain an excess of soluble salts--and devised methods for measuring the content of alkali in the field and for eliminating it under field conditions. It has studied hardpans, explained the manner of their formation, and suggested the means of improving lands affected with the different sorts.

These various activities have involved the making of thousands of analyses and the devising of much apparatus.

Advice and counsel is given the public on all matters connected with soil chemistry.

Physical Investigations.

Statutory provision: For physical investigations of the important properties of soil which determine productivity, such as moisture relations, aerations, heat conductivity, texture, and other physical investigations of the various soil classes and soil types, appropriation, 1920, $12,225.

Under this activity the bureau has investigated the physical properties of soils. It has devised apparatus for measuring the temperature of soils, the movement of water and of air and other gases in soils. The absorption of water, the extent and rate of capillary action, the effect of pressure on the concentration of the nutrient solution, and on the retention of that solution in the soil, the relation of soils to erosion, and

many kindred problems have been worked upon.

In the classification of soils it is necessary to determine the texture--or the proportion of grains of different sizes that go to make up the individual types. A method for doing this has been devised, and many thousands of mechanical analyses have been made.

Investigation of Fertilizer Resources.

Statutory provision: For exploration and investigation within the United States to determine possible sources of supply of potash, nitrates, and other natural fertilizers, appropriation, 1920, $36,840.

Under this head the bureau has surveyed the fertilizer resources of the country. The phosphate fields of Florida, the Carolinas, Kentucky, and Tennessee have been covered by special reports, the methods of mining and manufacture scrutinized, with a view of suggesting improvements in methods looking to the elimination of waste and a better and cheaper product. In the nation-wide search for natural deposits of potash and nitrates the bureau took an active part with the United States Geological Survey. As a result of its efforts the possibility of recovering potash now going to waste up the stacks of cement mills and blast furnaces was given wide publicity and a beginning made in saving this material, which, were it all saved, would practically meet our present needs. Investigation of our nitrate resources has led to encouragement of coking companies to substitute the modern by-product oven for the wasteful beehive type of oven.

The bureau has also worked upon the problem of the fixation of nitrogen found in the air in its experimental factory at Arlington, much advance having been made. Carried to its logical conclusion this move will result in supplying easily all the nitrogen the country needs in agriculture and industry.

The salvage of city wastes and their use in the manufacture of fertilizer has been the subject of exhaustive study. The results have been placed at the disposal of cities desiring assistance and plants have been installed by some for carrying out the work.

Soil Survey Investigations.

Statutory provision: For the investigation of soils, in cooperation with other branches of the Department of Agriculture, other departments of the Government, State agricultural experiment stations, and other State institutions, and for indicating upon maps and plats, by coloring or otherwise, the results of such investigations, appropriation, 1920, $178,900.

Under this general project soil surveys have been made in all the States of the Union. The surveys are of two kinds; detailed surveys on the scale of one inch to the mile usually covering county units, and reconnoissance surveys much more general in character, made on scales of four to six inches to the mile and covering large areas. At the close of the last fiscal year an area of 331,487,360 acres had been surveyed in detail and 322,760,960 acres on a reconnoissance basis. These surveys involve the identification and classifications of the many types of soils found in various parts of the country, a study of their agricultural value, and a determination of their relation to the various crops and systems of agriculture.

The results of the soil survey work form a basis for the logical advancement of agriculture through experimentation of scientific workers in all its varied lines.

Land Classification.

Statutory provision: For examination of soils to aid in the classification of agricultural lands in cooperation with other bureaus of the department and other departments of the Government, appropriation, 1920, $15,000.

This work is done in cooperation with the Forest Service and other departments of the Government, and has for its purpose the exclusion, from the National Reserves, of lands that are suited for agriculture.

Potash Investigations.

Statutory provision: For the completion, operation, and maintenance of the Government kelp plant at Summerland, California, appropriation, 1920, $192,900: Provided, That the product obtained from such experimentation may be sold at a price to be determined by the Secretary of Agriculture, and the amount obtained from the sale thereof shall be covered into the Treasury as miscellaneous receipts.

An interesting special investigation in connection with the potash supply has to do with the extraction of this salt from the giant kelp of the Pacific Coast. A fully equipped factory has been operated at Summerland, California, for the last two years, and thousands of dollars worth of potash has been sold to the fertilizer trade or direct to farmers.

The plant will be operated during the coming fiscal year, a careful study being made of the practicability of recovering various by-products, so that the industry may be able to compete with imported potash and the kelp beds may become a permanently valuable asset of the Nation.

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UNITED STATES DEPARTMENT OF AGRICULTURE

June, 1920

WEATHER BUREAU

A Daily Service of the Science of Meteorology

Applied to Human Welfare.

Charles F. Marvin, Chief.

Agriculture is only one primary interest which the Weather Bureau is required to serve.

Congress has placed the Weather Bureau in the Department of Agriculture, but the law says the Weather Bureau must serve commerce and navigation as well as agriculture. This point is emphasized in order that those whose primary interests are of necessity chiefly agricultural, may nevertheless clearly recognize how comprehensive and far-reaching is the great public service which the Weather Bureau is required to render. There is scarcely any important industry or activity of the nation which is not to a greater or less extent influenced by weather conditions, and therefore needs the advices, information and economic benefits which flow from the full and efficient administration of all the duties of the Weather Bureau.

When Congress created the weather service in 1870, the primary object was to benefit and protect navigation on the Great Lakes and Atlantic coast by advance warnings of dangerous storms. Later the issue of flood warnings was added to its duties. To-day we have the Weather Bureau unequaled by any like organization anywhere in the world -- unequaled in the many and direct ways in which the foreknowledge of atmospheric conditions is made economically beneficial to the Nation.

These benefits flow in a great variety of ways and the information, advices and warnings of the bureau serve the immediate needs of practically every interest and industry of the Nation. Great atmospheric disturbances visit with relative frequency one section of the country or another. Violent storms, cold waves, frosts, freezes, hurricanes, floods, heavy snows, and the like, repeatedly cause destruction of property, such as shipping on the Great Lakes and coastal waters of the Nation, and, in recent times, the lives and property engaged in aerial navigation. Crops and farms in flooded districts are laid waste. Lambs, live stock, and meat animals in the stock ranges of the West are killed by blizzards and cold waves. Orchard crops, truck gardens, and vineyards everywhere are damaged by frosts and freezes. By forecasts and warnings, issued and disseminated well in advance, great economic benefits and saving accrue to the Nation through the precautionary measures which can be taken on timely advices

to minimize or ward off injuries which otherwise inevitably attend the great atmospheric phenomena mentioned. Efficiency in the execution of this work requires military promptness and fidelity in the execution of orders. It frequently entails continuous duty, day and night, whenever exigencies arise, regardless of the conventional hours of work, Sundays and holidays.

Organization of the Bureau

The City of Washington is the administrative headquarters from which the entire service is managed and directed. It is also a principal station for observations and a district center for the preparation and distribution of forecasts and warnings of the most complete and comprehensive character.

Principal stations. In all, the bureau now maintains about 200 principal stations. These serve a double purpose, first to supply promptly and regularly twice daily, or more frequently when necessary, observations and telegraphic reports of atmospheric conditions at practically the same moment of time over the entire country. The regular hours of observation are 8 a.m. and 8 p.m., 75th meridian time. These hours correspond to 7, 6, and 5 a.m. and p.m. in the central and far western sections of the country and show the time at which Weather Bureau men go on duty.

The second purpose served by the 200 principal stations is that of local centers for the immediate distribution of the various kinds of forecasts, warnings, advices and information which constitute the service of the bureau to the Nation and includes the distribution effected through the public press, telegraph, telephone and otherwise. For the most effective conduct of these operations Forecast Centers are maintained at:

Washington, D. C., for the Eastern and East Gulf States

Chicago, Ill., for the Northwest east of the Rocky Mountains

Denver, Colo., for Colorado and contiguous States

New Orleans, La., for Louisiana and Southwest States

San Francisco, Calif., for Pacific Coast and adjacent States

The Climatological District Centers for collecting and publishing observations to establish the climate of the country are maintained in practically each large State, including Alaska, Porto Rico, and the Hawaiian Islands.

Auxiliary Stations. The principal stations are supplemented by another large group of auxiliary stations at which certain special observations are made or some particular service is performed. The observers or agents employed at these stations give but a small part of their

time to Weather Bureau work, for which they are paid a small fee. The total number of these stations is about 1350 at the present time and they are grouped in the following classes:

River Observers, to gage and report river stages, sometimes rainfall, and to perform related work in the River and Flood Warning Service, including the measurement of snowfall in the mountainous regions of the West.

Storm Warning Displaymen. For the display of storm warnings, including the distribution of advices, information and messages, and in some cases the making and reporting of special meteorological observations.

Substations for Service in Agricultural Meteorology, comprising stations in the cotton regions, corn and wheat regions, cattle regions, sugar and rice regions, and including pay of observers at certain special meteorological stations in fruit districts, cranberry marshes, tobacco and alfalfa districts, and other miscellaneous related requirements.

Cooperative Observers. Finally, there remains one additional large group of stations. The observers at these stations are called cooperative observers, and their simple duties are performed in a public spirited way without monetary compensation of any kind. There are two sub-groups comprising land stations and sea stations; the latter aboard ships of the Merchant Marine and commercial passenger traffic. The work in general comprises one observation a day, reported at the end of the month or on arrival in port by mail. The data serve to establish the climate of the country and the storm and weather conditions over the oceans. Observers receive certain publications, charts, etc., if they desire them. The instruments for equipment of the land stations are supplied by the bureau. With rare exceptions, ships provide all necessary instruments, but the bureau supplies to all classes of observers the forms on which observations are entered.

The total number of the cooperative observers is approximately 6,000.

Service

> The great majority of the public know little more of the Weather Bureau than the weather statement and forecast which appears in the daily papers. The fact is, this is only a very small part of the service. The economic benefits from Weather Bureau work result from a long category of special advices and warnings which, while published in the newspapers, are also distributed directly to the people who need the service and who are the direct beneficiaries. These special services may be mentioned as follows:

(1) Warnings of Violent and Severe Storm Conditions at sea, in the interest of navigation of the coastal waters, the Caribbean Sea, the Gulf of Mexico and the Great Lakes, including the region around the Hawaiian Islands. Indeed, the advices cover also storm conditions of only moderate intensity for localities in which the operation of small craft is involved or is likely to be injuriously affected by the expected conditions. On the occasion of violent storms on the Lakes or in the Gulf, no means are spared to place the advices and warnings as long in advance as possible in the hands of every vessel master and maritime agency in any way interested. Warnings are broadcasted by wireless to ships afloat.

(2) River and Flood Warnings. This service is like the storm and hurricane warning service in its effects on restricted localities and at wide intervals of time, but it also is of great value to the commercial, industrial and agricultural interests in whatever regions are inundated, and always is effective in saving vast amounts of property which is capable of being moved from affected regions, and in some cases great saving of life also results.

(3) Shippers' Forecasts. During the winter time particularly, this service is of great benefit to commerce, industry and transportation, especially of perishable products. Commission merchants, shippers and agents handling commodities of this character are advised in advance of temperatures detrimental to perishable products and to which shipments in particular directions are likely to be exposed. This enables railroad men and others interested to properly protect shipments by heating or icing cars, and in other ways mitigate the losses and claims which would result from damage in shipment.

(4) Aerological Work. This work has reference to the investigations and observations of conditions in the atmosphere made at considerable altitudes above the surface of the earth. The investigations are of the greatest value to the science of meteorology, but have their immediate application in the interest of the public in the warnings and advices of flying conditions for aerial navigation. This is a relatively new service resulting from the actual realization of practical navigation of the air, and is an outgrowth of developments incident to the war.

(5) Meteorological Information and Data. It is difficult to itemize the enormous aids to commerce and industry afforded by the bureau in its responses to calls for meteorological information useful in the conduct of business. It is surprising to know that blast furnace operators, shippers of iron ore, managers of textile mills, and manufacturers of patented articles are furnished by the Weather Bureau with much information of a meteorological character that is exceedingly helpful in the technical operations involved in their several industries.

The foregoing important services of the bureau bear only indirectly upon the agricultural welfare of the Nation. The services listed below, however, are specifically beneficial to agriculture.

(6) Frost Warnings and Special Fruit Frost Service, Alfalfa Warnings, etc. It has been conclusively demonstrated that the damages by spring frosts in the horticultural sections of the country can be greatly mitigated, or even prevented entirely, by proper methods of artificially heating the orchards. The Weather Bureau undertakes to tell the horticulturist in advance when frosts are coming, what the probable minimum temperature will be, and even to aid in organizing the work of artificially heating the orchards by specifying the time to light the fires and to perform other operations insuring the success of the contest with the adverse forces of nature. The economic benefits of this service can hardly be estimated when the market value of the crops protected and saved is taken into consideration.

A like service is extended to trucking interests, sugar-cane growers, and many other agricultural interests which may be benefited by forewarnings of early or late frosts and of atmospheric conditions detrimental to them.

Advices of weather conditions favoring the cutting and harvesting of alfalfa, and operations of a like kind, is another specific service in the interest of agriculture.

(7) Cattle Region Service. This is a service operated during the summer season especially, having for its object the dissemination of authentic information concerning weather and especially precipitation conditions over the stock ranges and stock-raising districts of the west, enabling

stockmen to determine upon the best distribution of their cattle in the grazing districts and the places where grazing is most plentiful or the reverse.

(8) Stock Warning Service. This is closely allied to the cattle region service. In this the Weather Bureau stands guard for the stock-raising interests and advises them of the approach and severity of cold waves, storms and atmospheric conditions injurious to cattle. With ample warning in advance, the weak stock can be brought to shelter, weaklings and young stock properly cared for, and enormous losses of live stock prevented.

(9) Fire Weather Service. The studies of the Foresters and Weather Bureau employees have resulted in supplying a service on the part of the Weather Bureau to the National and State organizations which is helpful in the prevention and control of forest fires. These fires occur and become uncontrollable under certain atmospheric conditions connected with prolonged dry weather, the oncoming of high winds, and the like. Advices from the Weather Bureau to forest-fire fighting agencies accomplish the most effective distribution of fire prevention and suppression agencies, and contribute in a material way to reduce the hazard from forest fires and to check and limit the losses in the cases of fires already under way.

(10) Weather and Crop Bulletin. In addition to the foregoing specific services, the bureau maintains the so-called Weather and Crop Bulletin. The object of this service is to get the fullest possible information to the agricultural interests of the country as to the weather conditions, week by week, throughout the great agricultural regions of the country. The effect of this weather on the crop condition and its progress is also mentioned. This service is rendered through a weekly bulletin issued at a great many outlying stations of the country, and also at Washington. During the winter season the bulletin is continued in a reduced form but in such a way as to preserve the continuity of the weather reports in the interest of agriculture throughout the year.

(11) Highway Weather Service. This service, which is of a general character, has recently been inaugurated in a very limited way as an outgrowth of the war conditions. It consists of adding to the forecast messages and bulletins issued by the bureau at a number of its stations advices as to the conditions of the principal highways of travel. This information is of

enormous interest and use to the great body of the public using the highways in extensive travel, but at the present time the work is greatly limited, due to the lack of adequate funds.

Personnel

> A presentation of the work of the Weather Bureau would be incomplete without conveying an idea of the conditions of employment. A concrete, and perhaps the best, illustration of this is the case of the men assigned to duty in the field. On December 1, 1919, the total number of men was 483, and the actual average basic pay of these employees was $1,375 per annum. Two hundred of these officials are in charge of important stations. Very few of the salaries are as high as $2,000. The assistants, numbering from one to several, necessarily receive compensations much lower. In addition to this basic pay these employees receive, as a rule, the bonus of $240 per annum.

Considering the importance of the Weather Bureau work, the fact that these employees must in the main have high educational qualifications, must associate with representative men of the communities where the service is rendered, and otherwise be representative citizens as well as representatives of an important service of the government, the compensation is utterly inadequate.

A brief statement of conditions in the two salary grades just below and just above the average are representative of the services of these grades in the Weather Bureau:

In the $1,260 class, one worked 7 years to reach it, another 8, one 9, one 10, one 11, one 12, two 13, three 14, one 15, one 16, one 18, one 21, one 22, one 24, one 28, one 31, one 34, two 35, one 36, one 39, one 40, one 42, and one 2 years.

In the $1,440 salary class there are 50 men who have worked from 7 to 42 years. The majority in this salary class are from 20 to 35 years.

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